A Thesis in General Surgery

COMPARITIVE STUDY OF ONLAY AND PREPERITONEAL MESH REPAIR IN THE MANAGEMENT OF VENTRAL HERNIA

Submitted in partial fulfilment of the
Requirements for the Degree of
M.S General Surgery
(Branch I)

Kilpauk Medical College

The Tamilnadu Dr. M.G.R Medical University

Chennai

April 2016

DECLARATION BY THE CANDIDATE

I hereby declare that this dissertation **titled "COMPARITIVE STUDY OF ONLAY AND PREPERITONEAL MESH REPAIR IN THE MANAGEMENT OF VENTRAL HERNIA"** is a bonafide and genuine research work carried out by me under the guidance of Dr. S.Balakrishnan, M.S., Professor, Department of General Surgery, Kilpauk Medical College, Chennai.

This dissertation is submitted to THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY, CHENNAI in partial fulfillment of the requirements for the degree of M.S. General Surgery examination to be held in April 2016.

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This is to certify that the dissertation titled "**COMPARITIVE STUDY OF ONLAY AND PREPERITONEAL MESH REPAIR IN THE MANAGEMENT OF VENTRAL HERNIA** " is a bonafide research work done by **Dr. Durai Raj. M,** Post Graduate in M.S. General Surgery, Kilpauk Medical College, Chennai under my direct guidance and supervision in my satisfaction, in partial fulfillment of the requirements for the degree of **M.S. General Surgery.**

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CERTIFICATE OF APPROVAL

The Institutional Ethical Committee of Govt. Kilpauk Medical College, Chennai reviewed and discussed the application for approval "Comparative study of onlay and preperitoneal mesh repair in the management of ventral hernia"-For Project Work-submitted by Dr.M.Durai Raj, M.S. Post Graduate, Department of General Surgery, Govt Kilpauk Medical College, Chennai-10.

The Proposal is APPROVED.

The Institutional Ethical Committee expects to be informed about the progress of the study any Adverse Drug Reaction Occurring in the Course of the study any change in the protocol and patient information /informed consent and asks to be provided a copy of the final report.

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INTRODUCTION As a result of in man's erect posture, his anterior abdominal wall is the site of a variety of hernias. Most of these hernias protrude through the abdominal wall to form obvious palpable swellings Protrusion of an abdominal viscus or its parts through the anterior abdominal wall occurring at any site other than groin is known as ventral hernia.. It includes incisional hernias, umbilical hernia, epigastric hernias paraumbilical hernias and spigelian hernias respectively.1 The patient seeks medical advice for swelling, acute pain, discomfort, associated gastrointestinal symptoms or cosmetic symptoms, diagnosis can be achieved with ease by clinical examination and by ultrasound scanning. A number of predisposing factors have been identified that may be related to specific patient characteristics, an underlying pathologic process, or iatrogenic factors. From the surgeons perspective, repair of hernias is common procedure. There are various surgical techniques for the hernia repair. All Incisional hernias are unique in that they are the only abdominal wall hernias that are considered to be iatrogenic. For many years,

high recurrence rate is associated **in the repair of incisional hernia.** 26

In more recent years,

the introduction of synthetic prosthetic materials has provided the opportunity to perform a tension free repair, thereby reducing the rate of recurrence. 23

Midline hernia occurring through linea alba abutting superiorly or inferiorly on the umbilicus is called as "PARAUMBILICAL HERNIA". They are generally acquired lesions. If the defect is small it can be repaired surgically. But large hernias with wide openings are difficult to repair surgically and should be treated with synthetic mesh repair. Epigastric hernia protrude through linea alba above the umbilicus. Approximately 5% of the populations have epigastric hernias. After diagnosis of an epigastric hernia, there is no reason to wait for repair, the chances for incarcerations are high and surgery remains the only permanent cure. Most of the spigelian hernias are acquired and requires surgery as the chances of intestinal obstruction is high. OBJECTIVES OF THE STUDY The main objectives and aims of this study is to: 1. To study the anatomical, etiological, clinicopathological, factors leading to ventral hernias. 2. To study the different techniques of

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Last but not the least, I thank God for being the prime force in guiding me throughout.

LIST OF ABBREVIATIONS

C/O	COMPLIANTS OF
DM	DIABETES MELLITUS
HT	HYPERTENTION
COPD	CHRONIC OBSRUCTIVE PULMONARY DISEASE
PS	PREVIOUS SURGERY
DIAG	DIAGNOSIS
USG	ULTRASONOGRAM
SOD	SIZE OF DEFECT
W I	WOUND INFECTION
RECCUR	RECCURENCE
DOS	DURATION OF STAY IN HOSPITAL
IP NO	IN PATIENT NUMBER
F	FEMALE
M	MALE
S	SWELLING
S+P	SWELLING AND PAIN
UM	UMBLICAL HERNIA
PM	PARA UMBLICAL HERNIA
IH	INCISIONAL HERNIA
EH	EPIGASTRIC HERNIA

C	CONFIRMED
IL	ILEUM
JJ	JEJUNUM
OM	OMENTUM
OL	ONLAY MESH REPAIR
PPM	PREPERITONEAL MESH REPAIR
FLAP NEC	FLAP NECROSIS

ABSTRACT

BRIEF RESUME OF INTENDED WORK

Ventral hernia in the anterior abdominal wall includes both spontaneous and, most commonly, incisional hernias after an abdominal operation. . Hernia recurrence is distressing to patient and embarrassing to surgeons. Mesh repair can be pre- peritoneal or onlay. Controversy exists among the surgeons regarding the use of type of either meshoplasty, due to differences in ease in performing the surgery, time of surgery, complications occurring in the post operative period and the recurrence.Only few institution do preperitoneal mesh repair due to the need of skilled surgeon, so we are comparing onlay and preperitoneal mesh repair.

AIMS AND OBJECTIVES OF THE STUDY

To compare outcome of onlay and preperitoneal mesh repair in the management of ventral hernia.

Materials and methods

METHOD OF COLLECTION OF DATA

Patient admitted with ventral hernia are included in the study with details of cases,clinical examination and symptoms are included in the study after confirming the diagnosis by ultrasonography and are divided randomly into onlay and preperitoneal group with 25 patient in each group.Patient are followed for six months

to study the outcome reccurence.

PERIOD OF STUDY : November 2014 to April 2015

TYPE OF STUDY : Randomized control study.

SOURCE OF DATA :

Patient diagnosed as ventral hernia in department of general surgery, Royapettah hospital and kilpauk medical college hospital. 50 of them are to be selected on basis of non probability (purposive) sampling method.

INCLUSION CRITERIA :

Patient with ventral hernia including

- Umbilical hernia,
- Paraumblical hernia,
- Epigastric hernia
- Incisional hernia.

EXCLUSION CRITERIA :

Patient admitted with

- Groin hernia ,
- Divarication of recti,
- Recurrent hernia,
- Patient medically unfit for surgery,
- Obstructed and strangulated hernias.

CONCLUSION :

By analyzing the outcome of seroma, wound infection, flap necrosis and recurrence in both groups the final result will be submitted in my dissertation.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

INTRODUCTION

As a result of in man's erect posture, his anterior abdominal wall is the site of a variety of hernias. Most of these hernias protrude through the abdominal wall to form obvious palpable swellings

Protrusion of an abdominal viscus or its parts through the anterior abdominal wall occurring at any site other than groin is known as ventral hernia.. It includes incisional hernias, umbilical hernia, epigastric hernias paraumbilical hernias and spigelian hernias respectively.[1]

The patient seeks medical advice for swelling, acute pain, discomfort, associated gastrointestinal symptoms or cosmetic symptoms, diagnosis can be achieved with ease by clinical examination and by ultrasound scanning.

A number of predisposing factors have been identified that may be related to specific patient characteristics, an underlying pathologic process, or iatrogenic factors. From the surgeons perspective, repair of hernias is common procedure. There are various surgical techniques for the hernia repair.

All Incisional hernias are unique in that they are the only abdominal wall hernias that are considered to be iatrogenic.

For many years, high recurrence rate is associated in the repair of incisional hernia. In more recent years, the introduction of synthetic prosthetic materials has provided the opportunity to perform a tension free repair, thereby reducing the rate of recurrence.

Midline hernia occurring through linea alba abutting superiorly or inferiorly on the umbilicus is called as “PARAUMBILICAL HERNIA”. They are generally acquired lesions. If the defect is small it can be repaired surgically. But large hernias with wide openings are difficult to repair surgically and should be treated with synthetic mesh repair.

Epigastric hernia protrude through linea alba above the umbilicus. Approximately 5% of the populations have epigastric hernias. After diagnosis of an epigastric hernia, there is no reason to wait for repair, the chances for incarcerations are high and surgery remains the only permanent cure.

Most of the spigelian hernias are acquired and requires surgery as the chances of intestinal obstruction is high.

OBJECTIVES OF THE STUDY

OBJECTIVES OF THE STUDY

The main objectives and aims of this study is to:

1. To study the anatomical, etiological, clinicopathological, factors leading to ventral hernias.
2. To study the different techniques of repair of ventral hernia with special emphasis on pre- peritoneal mesh repair and onlay mesh repair and their outcome.

REVIEW OF LITERATURE

REVIEW OF LITRETURE [2, 3,4,5,6]

The word Hernia is derived from the Greek word (Hernias, bud) meaning an offshoot, a budding or bulge. The Latin word Hernia means rupture or tear. Hernia was recognized about 1000 years ago. Probably the reason for this is the upright position which man has assumed during the revolutionary process. Hernia was treated by several ways with the available simple measures like bandages, ointment, poultices and localized concoctions. Cutting and countering operations were common in India, China and Japan long before Hippocrates..

Astley Cooper discovered the Transversalis Fascia and pointed out that this layer was the main barrier to herniation.

Lucas Championnere apparently was one of the first to use the overlapping fascia technique in 1891.

Arroyo and coworkers in Spain performed one of the very few randomized clinical trials with 200 patients. Their results showed a clear distinction between the success of using mesh repair and primary suture. The latter resulted in a recurrence rate of 11% while after using a tension free mesh repair is amounted to only 1%.

INCISIONAL HERNIA.

Witzel (1900), Goepel (1900), Barlett (1903) and McGavin (1909) advocated the use of Silver wire filigree. Koontz and Throckmorton (1948) used Tantalum Gauze.

Fascia Lata grafts used in the form of strips of sheets have been reported. Shortly the advent of synthetic Plastic sheets and the polyvinyl alcohol sponge were used.

The Modern era of prosthetic hernia repair began in 1958 when Usher reported his experiment with Polyamide mesh. Later braided polyester mesh, polypropylene mesh and expanded polytetrafluoroethylene (ePTFE) were introduced which revolutionized the surgery for post-operative Hernia.

HISTORY OF SURGICAL MESHES

Artificial material was introduced in 1889 by Witzel who used a mesh of silver wire for abdominal wall hernias.

In 1959, Usher et al. reported the successful implantation of surgical meshes at first in 13 dogs and after ward inpatients with abdominal wall hernias. Busse in 1901 even used meshes made of gold wire.

In 1940, Ogilvie published the use of cloth meshes to treat contaminated gunshot wounds with defects of the abdominal wall.

In 1949, Preston took meshes of metallic wire to treat hernia patients.

HISTORIC OVERVIEW OF MESH REPAIR[5]

No.	Event	Introduction
1	Polyester mesh	Wolsten Holme Arch Surg., 1956, 73,
2	Polypropylene mesh	Usher Arch. Surg. 1962;84;325
3	GPRVS	Stoppa et al., 1973 (72)
4	Trans-inguinal preperitoneal prostheses	Rives et al., chirurgie, 1973; 99:564.
5	Subfascial prosthesis	Lichtenstein and Schulman, 1986(44)
6	Preperitoneal prosthesis by extraperitoneal access	Nyhus et al., An. Surg., 1988; 208:733. Wantz, Surg., 1989;169:408
7	Mesh plug	Rutkow/Robbins Surgery, 1993; 114:3.
8	Plug Laparoscopy	Shultz et al., clin. Laser Mon., 1990;8:103
9	Intraperitoneal onlay mesh prosthesis (IPOM) Transabdominal preperitoneal prosthesis (TAPP)	Shultz et al., clin. Laser Mon., 1990;8:103 Corbitt, Surg. Laparos Endose, 1991; 1:23.
10	TEPP	Ferzil etal., laparosendcsc, Surg., 1992;2:281 McKerna Laws, Surg. Endosc, 1993;7:26.

PARAUMBILICAL HERNIA

Celsus in the first century A.D used an elastic suture[7] in the treatment of umbilical hernias.

Willian J Mayo[8.9], on Aug 4th 1898 delivered his classical paper, remarks on a radical cure of hernia. He instituted the new classical technique of

overlapping fascia for repair of umbilical hernia.

In 1979 Usher described a technique of repair using Marlex Mesh.

EPIGASTRIC HERNIA

Epigastric hernias were first described in 1285.

The term epigastric hernia was introduced by Leveille in 1812. The first successful operation on this hernia was reported by Maunnior in 1802. Ulrike Muschaweck in 2003 concludes using a Mesh plug in an epigastric hernia has advantages over the commonly used methods.

EMBRYOLOGY [10.11.12.13]

The abdominal wall begins to develop quite early in the embryo, but it does not achieve its definitive structure until the umbilical cord separates from fetus at birth. Most of the abdominal wall forms during closure of the midgut and reduction in relative size of the body stalk.

The primitive wall is somatopleure (ectoderm and mesoderm without muscle, blood vessels, or nerves). The somatopleure of the abdomen is secondarily invaded by mesoderm from the myotomes that developed on either side of the vertebral column. This mesodermal mass (hypomere) migrates ventrally and laterally as a sheet, and the edges differentiate while still widely separated from each other into the right and left rectus abdominis muscles. The final opposition of these muscles in the anterior midline closes the body wall. Before the primordial of the rectus muscles fuse anteriorly, the mesoderm from the hypomere splits into three layers that can be recognized by the seventh week of development. The inner sheet differentiates into the transverses

abdominis muscle, the middle sheet becomes the internal oblique muscle and aponeurosis. Dorsally, the superior and inferior posterior serratus muscles develop from the superficial layer of the hypomere.

Approximation of the two rectus abdominis muscles in the midline proceeds from both caudal and cranial ends and is complete by the 12^{th} week, except at the umbilicus. The final closure of the umbilical ring awaits the separation of the cord at birth, but the ring may remain open, in which case an umbilical hernia is present. Most such hernias gradually close spontaneously.

ANATOMY [14,15,16,17,18]

ANTERIOR ABDOMINAL WALL

The abdominal wall is a complex musculoaponeurotic structure. It is bounded by the flare of the costal margins and the xiphoid process of the sternum above and by the iliac crests, inguinal ligaments and pubis below.

The structures that comprise the anterior abdominal wall are skin, subcutaneous tissue, superficial fascia, antero-lateral muscles of the abdomen, together with their enveloping fascial sheaths and aponerosis, transversalis fascia,extraperitoneal adipose and areolar tissue and parietal peritoneum.

The linea alba, a tendinous raphe in the midline divides the anterior abdominal wall into two parts.

The umbilicus lies in the anterior median line, at the level of the disc between third and fourth lumbar vertebrae.

I. SUPERFICIAL FASCIA

The fascia contains fat, cutaneous nerves, cutaneous vessels and superficial lymphatics below the level of umbilicus fascia is divided into a superficial fatty layer (fascia of camper) and a deep membranous layer(fascia of scarpa). Most part of fascia is a single layer that contain variable amount of fat.

II. CUTANEOUS NERVES

Skin of anterior abdominal wall is supplied by the lower six thoracic nerves and by the first lumbar nerve.

III. CUTANEOUS ARTERIES AND VEINS

Anterior cutaneous arteries are branches of superior and inferior epigastric artery and accompany the anterior cutaneous nerves. Lateral cutaneous arteries are branches of the lower intercostals arteries and accompany the lateral cutaneous nerves. Superficial epigastric, superficial external pudendal, superficial circumflex iliac artery arise from the femoral artery and supply the skin of the lower part of abdomen. The venous drainage is by superficial epigastric, superficial external pudendal, superficial circumflex iliac vein which drains into femoral vein.

IV. SUPERFICIAL LYMPHATICS

Above the level of the umbilicus, the lymphatics run upwards to drain into the axillary lymph nodes. Below the level of umbilicus they run downwards to drain into superficial inguinal lymph nodes and pay respect to the watershed line.

V. MUSCLES OF THE ANTERIOR ABDOMINAL WALL

1. EXTERNAL OBLIQUE [OBLIQUUS EXTERNUS ABDOMINIS]

This muscle is largest and thickest of the flat abdominal muscles. Its broad origin includes the last eight ribs. Those from lower two ribs are attached to outer lip of anterior segment of iliac crest. The upper and middle fibres gives way to flat, strong aponeurosis at about the midclavicular line, and it inserts medially into the linea alba. The aponeurosis passes anterior to the sheath of the rectus abdominis and with care, it can be dissected from it. In general, the fascicles pass from the superolateral to inferomedial. Thus, the direction of force generated by contraction is superolateral.

Nerve supply: Ventral Rami of the lower six thoracic spinal nerve.

2. INTERNAL OBLIQUE [OBLIQUUS INTERNUS ABDOMINIS]

It originates from the last five ribs, the thoracolumbar fascia, the intermediate lip of the iliac crest and the lateral half of the inguinal ligament. Its fibres course opposite the direction of those of external oblique. It gives way to a flat aponeurosis medially, which splits to enclose the rectus muscle. The aponeurosis reunites medial to the rectus and inserts into the linea alba. The posterior lamina ends below in a free curved margin called Arcuate line midway between umbilicus and symphysis. The fibers that arise from the lateral half of the inguinal ligament pursue a downward course and insert into os pubis between symphysis and the tubercle. Some of the lower fibres are pulled into the scrotum by the testis as it passes through the abdominal wall and called the cremastric muscles of the spermatic cord.

Nerve supply: Ventral rami of lower six thoracic and first lumbar spinal nerves.

3. TRANSVERSUS ABDOMINIS MUSCLE

It is the smallest of the three flat muscles and originate from lower five ribs, the thoracolumbar fascia, the internal lip of iliac crest, and the lateral third of the inguinal ligament. The direction of its fibres is transverse and they give way to a flat aponeurosis that inserts into the linea alba. The aponeurosis passes behind the rectus sheath in its upper two-third. The fibres that originate from inguinal ligament pass downward to insert os pubis, as do the fibers of the internal oblique. Occasionally, the lower fibres of both muscles inserts by means of a common tendon called conjoined tendon.

Nerve supply: Ventral rami of lower six thoracic and first lumbar spinal nerves.

NOTE:

The neurovascular plane of the abdominal wall lies between the internal oblique and transverses abdominis.

The spigelian fascia is the aponeurotic part of transverses abdominis muscle between the medial border of its muscular part and the insertion of the aponeurosis into the posterior rectus sheath.

4. RECTUS ABDOMINIS

It is a long strap like muscle which arise by two tendinous heads. The lateral head arise from the lateral part of pubic crest. The medial head from the anterior pubic ligament. The fibres run vertically upwards and inserted into xiphoid process, seventh, sixth, fifth costal cartilages.

Nerve supply: Ventral rami of lower six or seven thoracic spinal nerves.

5. CREMASTER

The muscle is fully developed only in the male. In female it is represented by few fibres only. Along with the intervening connective tissue, the muscle loops form a sac like cremastric fascia around spermatic cord deep to external spermatic fascia.

Nerve supply: Genital branch of genitofemoral nerve derived from first and second lumbar spinal nerves.

6. PYRAMIDALIS

It is rudimentary in human beings. This is a small triangular muscle arising from anterior surface of body of pubis. Fibers pass upwards and medially to be inserted into linea Alba.

Nerve supply: Subcostal nerve which is the ventral ramus of the 12th thoracic spinal nerve.

III. DEEP ARTERIES AND VEINS OF ANTERIOR ABDOMINAL WALL

The anterior abdominal wall is supplied by superior epigastric and musculophrenic artery above, inferior epigastric and deep circumflex iliac artery below, small branches of lower two or three posterior intercostal, subcostal and lumbar arteries, superficial epigastric, circumflex iliac artery. The venous drainage is by superior epigastric and musculophrenic vein below, inferior epigastric and deep circumflex iliac vein below.

IV. DEEP NERVES OF THE ANTERIOR ABDOMINAL WALL

The anterior abdominal wall is supplied by lower and six thoracic nerves and by first lumbar nerve through its iliohypogastric and ilioinguinal branches.

V. FUNCTIONS OF ANTERIOR ABDOMINAL WALL MUSCLES

The abdominal muscles provide a firm but elastic support for the abdominal viscera against gravity. This is chiefly due to the tone of the oblique muscles, especially the internal oblique.

The oblique muscles assisted by the transverses, can compress the abdominal viscera and this help in all expulsive acts, like micturition, defecation, parturition, vomiting.

The external oblique can markedly depress and compress the lower part of the thorax producing forceful expiration, as in coughing, sneezing, blowing,

shouting. Flexion of the lumbar spine is brought about mainly by the rectus abdominis. Lateral flexion of the trunk is done by one sided contraction of the oblique muscles. Rotation of trunk is by action of external oblique with opposite internal oblique.

VI. RECTUS SHEATH

This is an aponeurotic sheath covering the rectus-abdominis muscle. Above the costal margin anterior wall is formed by external oblique aponeurosis, posterior wall is deficient. Between the costal margin and the arcuate line anterior wall is formed by external oblique aponeurosis and anterior lamina of the aponeurosis of the internal oblique, posterior wall is formed by posterior lamina of the aponeurosis of the internal oblique and aponeurosis of the transverse muscle. Below the arcuate line anterior wall is formed by aponeurosis of all the three flat muscles. The aponeurosis of the transverses and internal oblique are fused, but external oblique aponeurosis remains separate. Posterior wall is deficient.

VII. LINEA ALBA

The linea alba is a tendinous raphe formed by interlacing of the fibres of the three aponeurosis forming the rectus sheath. It extends from the xiphoid process to the public symphysis. Above the umbilicus it is about 1 cm wide, but below the umbilicus it is narrow and difficult to define. It is so called because it is a white line.

VIII. FASCIA TRANSVERSALIS

This fascia lines the inner surface of the transverses abdominis muscle. It is more properly should be called the endoabdominal fascia because it is a continuous lining of the abdominal cavity and is considered to be the strongest layer of the abdominal wall.

Deep inguinal ring is an oval opening in the fascia transversalis. Anteriorly, it is adherent to the linea alba above the umbilicus. Posteriorly, it merges with the anterior layer of the thoraco lumbar fascia and is continuous with the renal fascia. Superiorly, it is continuous with the diaphragmatic fascia. Inferiorly, it is attached to the inner lip of the iliac crest and to the lateral half of the inguinal ligament. At both these places it is continuous with the fascia iliaca. Medially it is attached to public tubercle, the pubic crest and the pectineal line. Part of it is prolonged into the thigh as the anterior wall of the femoral sheath.

IX. CONJOINT TENDON

It is formed from lower fibres of internal oblique and lower part of aponeurosis of transverse abdominis. It is attached to pubic crest and pectineal line. It descends behind the superficial inguinal ring and acts to strengthen the medial portion of the posterior wall of the inguinal canal.

X. INGUINAL LIGAMENT

It is the thick, in rolled lower border of the aponeurosis of external oblique and stretches from anterior superior iliac spine to the pubic tubercle. Its grooved abdominal surface forms the floor of the inguinal canal.

XI. EXTRAPERITONEAL ADIPOSE AND CONNECTIVE TISSUE LAYER

It contains adipose tissue, inferior epigastric artery and vein and four fetal structures, medial umbilical ligaments (obliterated umbilical artery), obliterated urachus (median umbilical ligament), ligamentum teres (obliterated umbilical vein)**.**

XII. PARIETAL PERITONEUM

It is the inner most layer. It is thin layer of dense irregular connective tissues and this is covered on the inside by layer of simple sequences mesothelium. The peripheral membrane is innervated from above downwards is a sequational manner by spinal nerves T7-L1. The peritoneum provides little strength in wound closure, but it apart protection from infection if it remains unviolated.

INCIDENCE

POST-OPERATIVE VENTRAL ABDOMINAL HERNIA [2]

In the best centers, the incidence of post-operative hernia has been at least 10% as shown by long term follow up studies. Where less emphasis is placed on the niceties of abdominal wound closure, the incidence is much higher. Recent studies show that about 2/3 appear with in first five years and that at least another third appear 5 to 10 years after the operation. As longer and more accurate follow up studies are done, it will probably be shown that with ageing and weakening of the tissues, post-operative hernias may appear even more than ten years after the original operation.

PARAUMBILICAL HERNIA

Estimates of the incidence of umbilical hernia at birth vary greatly. In Caucasian infants, they range between 10-30%. In children of African descent, it may be several times greater. Children with raised intrabdominal pressure owing to ascites, COPD, or ventriculoperitoneal shunt, also tend to develop an umbilical hernia.

The incidence of paraumbilical hernia in the adult is unknown[19]. It is more common in the female, with a female to male ratio of 3:1, middle aged, obese, multiparous females are prone to develop significant paraumbilical hernia, as are individuals with ascites, usually secondary to cirrhosis of the liver. In addition, as Mayo suggested in 1899, the old, cachectic and feeble are subject to umbilical hernia and likely to develop complications.

EPIGASTIC HERNIA [2]

The frequency of epigastric hernia in the general population is estimated to be about 5%. It is more common in early adulthood and middle age. This hernia is three times more common in men than in women. Upto 20% of Epigastric hernias may be multiple, but usually one is dominate. Epigastric hernias account for 0.5% to 5% of all hernias operated on.

ETIOLOGY

INCISIONAL HERNIA[2]

Many factors, singly, or in various combinations, may cause failure of the wound to heal satisfactorily and may lead to the development of a post-operative hernia.The common causes are poor surgical technique and sepsis. The causes are explained below;

1. POOR SURGICAL TECHNIQUE

a) Non-anatomic incisions

Vertical pararectus incision made in rectus sheath along lateral border , which destroys nerve and vascular supply to the tissues medial to incision, causing them to atrophy.

b) Layered closures

These are followed by a greater incidence of post-operative hernias than are wounds closed by the single layer mass closure technique. This may be owing to the fact that many more sutures are used; which are closely placed, and because insufficiently sized bites of each thin layer are taken.

c) Inappropriate suture material

Wounds closed with non-absorbable suture material are followed by lower incidence of post-operative hernias than wounds closed with absorbable material. The ideal suture material for abdominal closure, especially of midline incision, in monofilament stainless steel wire used in the form of interrupted mass closure, taking large bites of the musculoaponeurotic layers from the abdominal wall. A good alternative is mass closure with a continuous heavy (1 or metric 4)

monofilament polyamide or polypropylene as a single thread or, preferably in the form of a commercially available loop.

d) Suturing Technique

Small sutures take only a small amount of tissues close to the cut edge of the incision. In vertical abdominal incision at; or near, the midline, these sutures pull in the line of fibers of the aponeurotic muscles and since they are so closed to the incision, easily cut out of the tissues. A small, tightly tied suture causes ischemia and necrosis of the tissues it contain and also of an area on each side of the suture. When these small, tightly tied sutures are placed close to each other, their ischemic areas merge and thus, cause necrosis of a strip of tissue all along the the incision edge, which separates, together with the sutures, from the rest of the abdominal wall, leading to failure of the wound

e) Tension

The lateral pull of the abdominal wall muscles against the suture reduces tension, which tends to pull them in the opposite direction, creates an area of pressure necrosis where the suture meets the tissue

2. Sepsis

It is the second major cause of early wound failure. It may range from frank acute cellulites, with fasciitis and necrosis of the tissues on each side of the incision, to low grade chronic sepsis around sutures such as silk.

The infection causes inflammation and edema of the tissues, which becomes soft and weakened so that the sutures tear the tissues and pull out under the strain of intra- abdominal pressure.

3. Drainage tubes

The tissue planes along the track of the drain are not sutured, an open and weak passage is present through all layers of the wound through which a hernia may develop if drain tube are brought out through operation wound.

Drain allows for two way traffic of secretions outwards and organisms inwards. The irritation caused by drain causes edema or softening and tearing of the tissues and cutting out of the sutures.

4 . Obesity

Obesity is associated with high percentage of port-operative hernias as well as with recurrence following repair of these hernias. Cutting through large masses of fat and the increased retraction needed may raise the infection rate in these patients and lead to recurrence. Tissues infiltrated with fat may not be able to hold the sutures, especially since the excess of intra and extra abdominal accumulation of many kg of fat may add enormous tension on the sutures. Obese patients tend to develop post-operative complications such as paralytic ileus, atelectasis, pneumonia and deep vein thrombosis that may increases the risk of incisional hernia.

5. General Condition

The general condition of the patient influences the rate of post-operative ventral hernia. The factors include age, generalized wasting, malnutrition and starvation, hypoproteinemia (especially hypoalbuminemia); avitaminosis (especially vitamin C), malignant disease, anemia, jaundice, Diabetes mellitus, chronic renal failure, liver failure, ascites, prolonged steroid therapy, immuno-suppressive therapy and alcoholism.

6. Post-operative Complications

These include prolonged post-operative paralytic ileus, intestinal obstruction with abdominal distension, chronic obstructive pulmonary disease, pulmonary collapse, bronchopneumonia, emphysema and asthma which increase the incidence of post-operative hernias.

7. Types of Operation

These include Laparotomy for generalized or localized peritonitis in patients with perforated peptic ulcer, appendicitis, diverticulitis and acute pancreatitis. Operation for intra- abdominal malignant disease, inflammatory bowel disease, re-operation through the original wound, especially within the first six months after the initial procedures have tendency to be followed by hernia.

8. Tissue Failure

Hernia develops in what apparently is a perfectly healed wound that has functioned satisfactorily for five, ten or even more year and after operation and is presumably the result of the failure of the collagen in the scar. Rodriques has recently shown a decrease in OXYTALAN FIBERS and an increase in the amorphous substance of the elastic fibers as a function of age and may be responsible for alterations in the resistance of the transversals fascia and abdominal wall scar tissue. Ageing and weakening of the tissue and increased intra-abdominal pressure associated with chronic cough, constipation and prostatism are cited as factors.

PARAUMBILICAL HERNIA

Etiological factors can be divided into congenital and acquired factors.

1. Congenital[20]

2. Acquired

a) Predisposing factors

1. Faulty umbilical cord ligation[20.]

Umbilical cord ligation > 4--5cm from the abdominal wall may give rise to development of hernia.

2. Umbilical sepis- weakness umbilical area

3. Increased intrabdominal pressure, due to chronic cough, constipation, straining while passing urine, ascites

4. Direct trauma.

b) Contributing factors[7,19]

1. Low birth weight
2. Race
3. Sex: Female: Male=3:1
4. Family history: Familial history contributes but no generic pattern of inheritance has been seen.
5. Age: more common in children< 2yrs and elderly people.
6. Obesity

7. Multiparty due to stretching and weakening of anterior abdominal wall musculoaponeurotic layer.

8. Associated conditions-some congenital condition like mongolism

cretinism, meningomyelocele, hurler's syndrome, and amourotic family idiocy may be associated with umbilical hernia. May be associated with cholelithiasis, abdominal malignancies, collagen disease, hemorrhoids, varicose veins, and cystocele.

EPIGASTRIC HERNIA[2,5]

The cause of epigastric hernia is unknown, but since it occurs even in new born children, it is assumed to be the result of a structural congenital weakness of the line alba between xiphoid process and the umbilicus. It is possibly owing to a lack of fibers at the midline decussation, which allows preperitoneal fat to be herniated between the gaps. The fact that it is common between 20 and 50 years of age probably reflects a balance between a congenital defect and a rise of intra-abdominal pressure, adiposity, and weakening of the muscles in adults. It is more frequent in people with a wide linea alba[2]

Epigastric hernia is generally considered an acquired lesion, probably related to excessive strain on the anterior abdominal wall aponeurosis.

Moschowitz emphasized the importance of blood vessels perforating the linea alba and prolongation of the transversalis fascia at this point.

Askar's studies also demonstrated that fibers originating from the diaphragm traverse the upper midline aponeurosis posteriorly and join the fibers of the posterior rectus sheath and middle tendinous intersection. They attach to the linea alba at a site midway between the xiphoid and the umbilicus. Uncoordinated vigorous, synchronous contraction of the diaphragm and upper abdomen may occur during straining and coughing. The force caused by upward

traction on the diaphragm and lateral traction on the tendinous intersection would be maximal at this point of attachment midway between the xiphoid and the umbilicus, the most common site of Epigastric Hernia.

DIVARICATION OF RECTI[21]

This is seen principally in elderly multiparous patients and also who has undergone repeated midline abdominal operations, in which linea alba may stretch.

CLINICAL MANIFESTATIONS

I. INCISIONAL HERNIA[2]

The patient's complain of an unsightly bulge in the operation scar as well as of pain and discomfort. They often suffer from a heavy, sickening, dragging sensation aggravated by coughing and straining. In large dependent hernias, areas of skin may undergo pressure ischemic necrosis and may ulcerate, and rarely, the hernia may rupture. If the hernia strangulates, the symptoms of intestinal obstruction and ischemic bowel will supervene. There is often a history of repeated mild attacks of intestinal obstruction manifesting as colicky pains and vomiting. Intertrigo may develop in the deep crease between the hernia and the abdominal wall and the skin may become moist, infected and odorous. Obese patients with large pendulous hernias are practically immobilized and find life almost unbearable

II. PARAUMBILICAL HERNIA[7,19,23]

It usually develops in middle and old age and it is commonly found in case of obese females. The consistency is firm when it contains omentum and soft when the content is omentum and has most expansible cough impulse

III. EPIGASTRIC HERNIA[2]

The usual epigastric hernia is symptom less.It usually present with a small round swelling in the midline between xiphisternum and umbilicus. They are often irreducible, sometimes multiple. In obese patients the typical smooth, rounded, slightly tender lump may be lost in the depths of subcutaneous fat.

IV. DIVARICATION OF RECTI[22]

When the patient strains, a gap can be seen between the recti abdominis through which the abdominal contents bulge. When the abdomen is relaxed the fingers can be introduced between the recti.

DIAGNOSTIC IMAGING IN THE EVALUATION AND MANAGEMENT[5]

I. SONOGRAPHY

Sonography is indicated primarily in patients with palpable masses within deep layers of the abdominal wall.. In patients with hernia, a measurement of the defect can be done.

Incisional Hernia

Sonography shows the typical hernial pattern with a fascial gap and protruding hernial sac. After mesh repair for hernia, a recurrence can occur at the edge of the mesh which can be seen sonographically.

In comparison with CT or herniography, the ultrasonography is time as well as cost saving and not burdened with risks such as contrast allergy.

Epigastric Hernia

The hernia is visualized by a characteristic midline fascial defect.

	Predictive Value			
	Sensitive	Specificity	Positive test	Negative test
Epigastric Hernia	100%	100%	100%	100%

Divarication of Rectus Abdominis

Can be clearly visualized by sonography and the resulting herniation in abdominal wall.

II. COMPUTED TOMOGRAPHY

Computed tomography is an excellent method of evaluating the abdominal wall and its relations to the abdominal viscerae. Lesions can be easily identified, owing to their different density.

There are several reports in the literature concerning the primary diagnosis of spigelian hernia by CT which can elegantly demonstrate.

CT allows exact evaluation of the volume and content of giant hernias. CT is also used to differentiate postoperative findings such as haematoma, abscess, or recurrence of hernia after laparoscopic repair of ventral hernia.

III. MAGNETIC RESONANCE IMAGING

Compared to CT, MRI offers the advantage of direct multiplane imaging without ionizing radiation and the use of contrast agents. A relative merit of MRI is the excellent demonstration of abdominal wall layers.

IV. HERNIOGRAPHY

Herniography has a very low complication rate, disadvantage is accidental colonic puncture which is less than 1%, contrast allergy, and irradiation to pelvic region.

With the techniques now available, there is no indication for herniography, even if the complication rate is low because it is invasive.

The order of recommendations for the evaluation of abdominal wall hernias is as follows:

1. CLINICAL HISTORY
2. CLINICAL EXAMINATION
3. SONOGRAPHY
4. CT/MRI

OPERATIVE MANAGEMENT

PRE-OPERATIVE PREPARATION

1. Optimal skin hygiene.
2. Weight reduction for obese patient.
3. To stop smoking.
4. The repair of a large postoperative ventral hernia should be delayed for atleast one year after the operation that caused the hernia or after a previous attempt at repair.
5. Wait for atleast one year after all infection and sinuses have healed.
6. Associated cardiovascular, respiratory, renal conditions, Diabetes Mellitus, hypertension and other general illness must be diagnosed, assessed, and

treated. The operation is usually elective and must be delayed until the patient is in an optimal state.

7. Perioperative antibiotics are used more liberally.
8. The patient is investigated for coexisting abdominal pathology so that it can be dealt with at the same operation.

INDICATIONS

1. Pain and discomfort.
2. Large hernias with small openings.
3. A history of recurrent attacks of subacute obstruction, incarceration, irreducibility and strangulation,
4. For cosmetic reasons for a large and unsightly hernia.

GENERAL PRINCIPLES IN REPAIR OF VENTRAL HERNIAS

1) Spinal and epidural anaesthesia gives excellent relaxation with minimal respiratory depression.
2) Hemostasis should be as careful and as effective as possible.
3) Permanent suture material should be used for the repair.
4) The choice of incision is governed by the orientation of the defect.
5) Healthy fascia must be isolated.
6) Closure of the sac is done in one layer, incorporating both fascia and peritoneum after opening the sac, freeing all adhesions, reducing the viscera and exploring the abdomen.
7) Drain should be used wherever needed.

OPERATIVE METHODS FOR REPAIR OF VENTRAL HERNIA[2,5]

The three basic methods are

I. PRIMARY SUTURE OR EDGE TO EDGE CLOSURE

According to Bonnet's (writes in the fifth edition of Nyhus and Condon's Hernia) a fascial defect should be repaired by primary suture with non-absorbable suture and edge-to-edge closure.

The hernial sac is dissected, opened and all adherent omentum and loops of bowel are freed by dissection and mouth of the sac defined. The sac and its peritoneal lining, scar tissue, and old suture material are excised upto the edge of the defect to expose the normal tissues of the linea alba.

The fascial defect is sutered with monofilament polypropylene with interrupted sutures transversely or vertically. Full thickness bites or sutures taken on the abdominal wall along lower and upper margins of the hernia.

II. SHOELACE DARN REPAIR

This method is based on the understanding of the functional anatomy of the abdominal wall. Skin,subcutaneous tissue and fat are dissected from the hernial sac and rectus sheath. The new linea alba is now constructed, using a vertical strip 1-1.5 cm wide split off the medial edge of each anterior rectus sheath about 1 cm or more from medial edge to confirm the presence of rectus muscle. Two steps are sewn together. Next, suture started at the top end of the incision in the rectus sheaths from inside the sheath and passes out on that side, returning inside through opposite corner and slipping through the loop. The flat muscles are restored to their normal thickness and position by the continuous

prolene suture passing end- to-end in front of the rectus abdominis muscle, between art edges of external rectus sheath and through strong new midline anchor for the whole length of the hernia, in the manner of shoelace tightening of boot.

In obese patients panniculectomy and abdominoplasty are combined with repair of hernia.

A vacuum drain is placed on either side and brought out through separate stab.

The operation is entirely extraperitoneal. The post-operative recovery is smooth and rapid. Complications are few and usually minor. They are infection and the recurrence rate 2%.

II. NUTTALL PROCEDURE

For midline defects in the lower abdomen, this procedure has been reported to be quite effective. The lower aspect of the rectus abdominal muscle and its enveloping fascia are mobilized off the pubis and approximated to the contralateral bone. This manoeuvre provides anterior rectus sheath coverage for the lower midline defect.

V. CATTELL'S OPERATION

The sac is dissected and opened. The viscera are reduced after freeing the contents form the sac. The peritoneum is repaired. The edges of the abdominal wall are approximated and are sutured with non-absorbable suture material layer by layer. After the surrounding aponeurosis has been sutured an incision is made half inch away from the suture line. The medial edges of this incision

are sutured over the previous line of suture and the lateral margins are now sutured over this medical layer of suture. This is continued till the edges of the healthy aponeurosis are brought together firmly.

VI. KEEL OPERATION[21]

The hernial sac is not opened but pushed back into the abdomen. With non-absorbable suture it is pleated so that it projects into the abdominal cavity. A few layers of sutures are applied one after the other till the healthy margin of the muscles and aponeurosis are brought close. Now the margins of the healthy muscles and aponeurosis are sutured to each other. As in this operation the hernial sac is pushed into the peritoneal cavity in a pattern which on cross section looks like the 'keel' of a ship, this operation is called keel operation.

MAYO'S DOUBLE BREASTING[22,23]

The Mayo double breasting technique is most common surgical techniques routinely performed in most hospitals.

PROSTHETIC MESH REPAIR

CHOICE OF MATERIAL

The ideal mesh is one that is cheap and universally available, is easily cut to the required shape, is flexible, slightly elastic and pleasant to handle. It should be practically indestructible and capable of being rapidly fixed and incorporated by human tissues. It must be inert and elicit little tissue reaction. It must be sterilisable and non-carcinogenic.

Polypropylene mesh meets the requirements of the ideal prosthesis and is

today the most commonly used material for repair of all types of hernia.

a) POLYPROPYLENE MESH (MARLEX, PROLENE)

This is currently most widely used prosthetic material in hernial repair. It is formed of knitted monofilament plastic fibers and has minimal elasticity or stretch capacity. Prolene elicits an intense reaction in tissue.The disadvantages are visceral adhesions, erosion into the bowel/skin causing enterocutaneous fistula/ sinus formation, erosion of mesh into urinary bladder.

Sterilization: gamma radiation; after removal from its package, the mesh can be resterilised by autoclaving for three times only.

b) **PTFE (Teflon, Gore-Tex)**

It is supplied as a felted sheet in which fibers randomly interlace. It is used for vascular prosthesis. It is strong, pliable, soft, smooth and slippery to touch, biologically inert and causes little tissue reaction. It is costly.

c) POLYESTER MESH (DACRON) MERSILENE

It is multifilament knitted mesh. It is cheap, freely available, light, supple, has a pleasant, soft feel and is strong and elastic. It excites greater tissue inflammatory reaction than prolene. It tears easily.

d) **FASCIA LATA**

It is harvested from lateral aspect of the thigh. It is strong and flexible although minimally elastic. The use has been abandoned.The other prosthetic meshes tried are polyglycolic mesh, polyglactic mesh, metal meshes and gelatin film.

INDICATIONS FOR MESH REPAIR

The indications are:

a. Repair of recurrent incisional hernias: successful repair of recurrent hernias in patients, whose musculature is of poor quality and weak and flabby, fascial coverings are thin and weak, requires prosthestic material.

b. In primary repair of massive hernia in which tissues are deficient and repair without tension cannot be accomplished readily by conventional techniques of direct suturing. The employment of a bridging prosthesis in a massive incisional hernia will enable the surgeon to avoid excessive tension in wound closure and the hazards of increased intra-abdominal pressure.

c. When continued presence of forces tending to disrupt in the future are reasonably predicable. There are certain conditions which present a relatively high risk of recurrence unless prosthetic materials are used. They are chronic cough, increased intra-abdominal pressure from obesity and massive incisional hernias.

d. Losses of essential fascial segments by severe trauma, radical resection of malignant tumours involving the abdominal wall may sometimes require prosthetic materials for effective closure.

Hesselink et al. have shown that any ventral/incisional hernia greater than 4 cm and recurrent hernial have a high rate of recurrences if not repaired with mesh.

TYPES OF MESH REPAIR.

Onlay Technique

Polypropylene mesh is used in this technique.mesh is placed over the sutured anterior rectus sheath and sutured after closure of fascial defect.

Procedure

After managing hernial sac and its contents as described in Mayo's repair,anterior rectus sheath aponeurosis is approximated by using polypropylene suture and prosthetic mesh is placed above the aponeurosis and fixed by using polypropylene suture material. Suction drain placed .

The potential advantage of this repair keeps the mesh separated from the abdominal contents by full abdominal muscle fascial wall thickness.

Disadvantages of this repair include, seroma formation due tolarge subcutaneous dissection , under tension repair, wound infection and mesh infection. No studies available to accurately state recurrence rates with this repair.

Inlay Mesh Repair

After the hernia sac and its contents is reduced mesh is fixed after closing the peritoneum is closed Mesh is closed with anterior rectus sheath . Suction drain tube kept and all layer closed .

Intraperitoneal Underlay Mesh Repair

The open technique done by opening the hernial sac and dissecting the content and bowel from the abdominal wall and the mesh placed intraperitoneally with the tissue in growth side of the mesh against the muscular or fascial side

of the abdominal wall the non-adhesive surface of mesh facing against the abdominal contents.

VII. PREPERITONEAL MESH REPAIR (RIVES-STOPPA TECHNIQUE, RETRORECTUS MESH REPAIR)

Another promising technique is the Rives-stoppa procedure developed for the repair of ventral hernias. Prosthetic material which is used to close the defect in a so called sublay technique. The prosthesis is placed between the posterior rectus sheath and rectus abdominis muscle. Above the umbilicus, hernial dissection is performed above the posterior rectus sheath and underneath the rectus muscle and below the umbilicus, due to the lack of a posterior rectus sheath dissection to be done in the preperitoneal space. A large piece of polypropylene mesh is placed in the space created, and fixed to muscle layer above with full or partial thickness suture.

MATERIALS AND METHODS

MATERIALS AND METHODS

50 patients presenting with ventral hernia admitted to Royapettah hospital and kilpauk medical college hospital were preoperatively assessed clinically and by ultrasonography to confirm the diagnosis.25 patients each underwent pre-peritoneal and onlay mesh repair after obtaining consent and satisfying the inclusion & exclusion criteria.

Statistical significance was confirmed using software SPSS, version 20.0.

INCLUSION CRITERIA: All patients presenting with anterior abdominal wall hernias:

a. Umbilical hernias
b. Epigastric Hernias
c. Paraumbilical Hernias
d. Incisional Hernias.

EXCLUSION CRITERIA:

a) Groin Hernia
b) Divarication of Recti
c) Recurrent hernia
d) Patients medically not fit for surgery
e) Obstructed and strangulated hernia.

RESULTS

RESULTS

RED MARKED VALUES ARE P VALUE

Concept of P value

- If the P value is 0.000 to 0.010 then denoted by ** it imply Significant at 1 level (Highly Significant)

- If the P value is 0.011 to 0.050 then denoted by * it imply Significant at 5 level (Significant)

- If the P value is 0.051 to 1.000 then do not put star it imply Not Significant at 5 level (Not Significant)

Note:

If the P value is .000 then put it as <0.001**

Software used: SPSS, Version 20.0

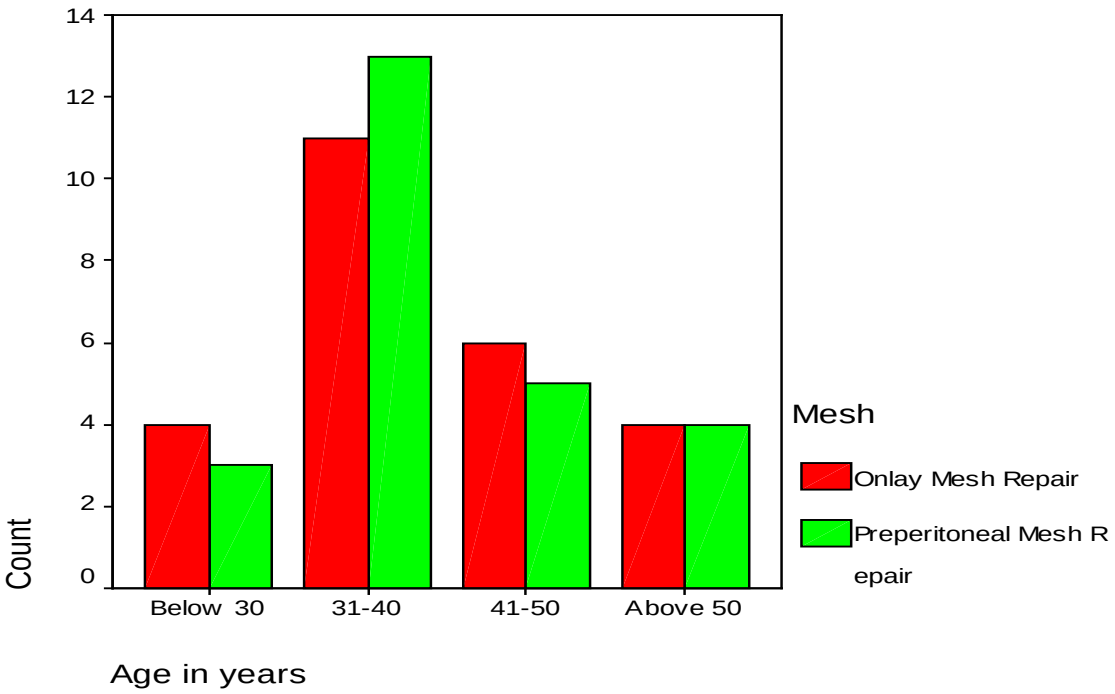
Age Distribution

The total number of cases studied was 50.The study showed that the maximum number of patients were in 3rd decade of life (48.0%).

Table 1 shows age disribution

			Mesh		Total
			Onlay Mesh Repair	Preperitoneal Mesh Repair	
Age in years	< 30	Count	4	3	7
		% within Age in years	57.1%	42.9%	100.0%
		% within Mesh	16.0%	12.0%	14.0%
	31-40	Count	11	13	24
		% within Age in years	45.8%	54.2%	100.0%
		% within Mesh	44.0%	52.0%	48.0%
	41-50	Count	6	5	11
		% within Age in years	54.5%	45.5%	100.0%
		% within Mesh	24.0%	20.0%	22.0%
	Above 50	Count	4	4	8
		% within Age in years	50.0%	50.0%	100.0%
		% within Mesh	16.0%	16.0%	16.0%
Total		Count	25	25	50
		% within Age in years	50.0%	50.0%	100.0%
		% within Mesh	100.0%	100.0%	100.0%

Figure 1 shows age distribution



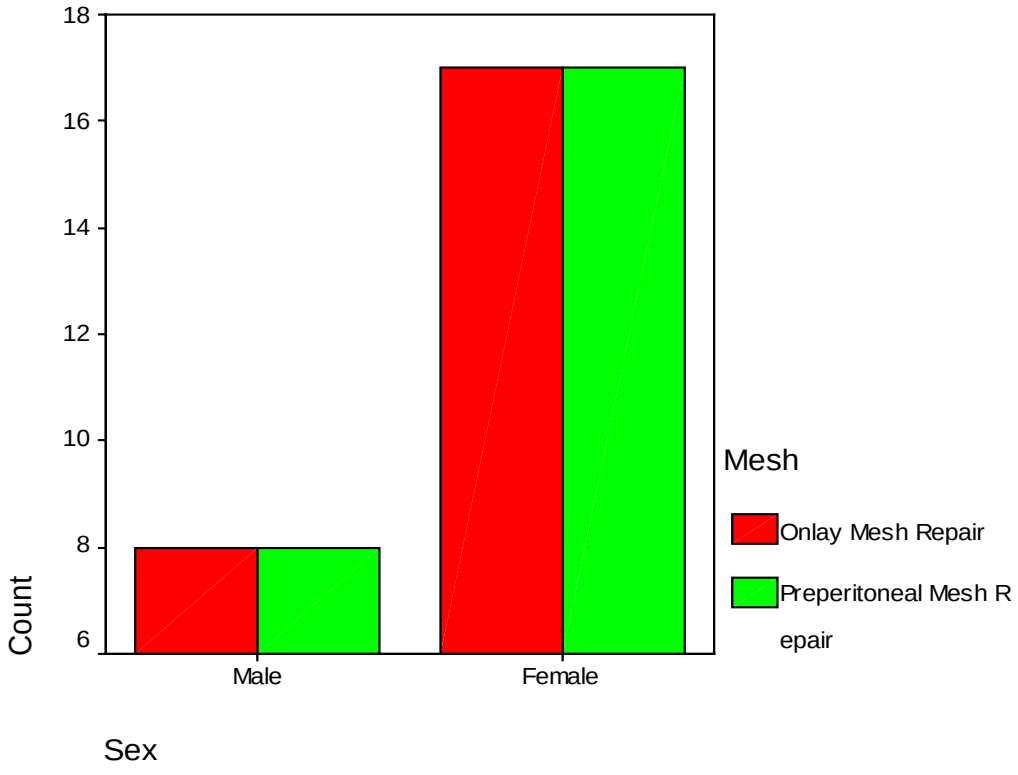
Sex distribution

In a total of 50 cases, 34 patients were females and 16 patients were males.

Table 2 shows sex distribution

			Mesh		Total
			Onlay Mesh Repair	Preperitoneal Mesh Repair	
Sex	Male	Count	8	8	16
		% within Sex	50.0%	50.0%	100.0%
		% within Mesh	32.0%	32.0%	32.0%
	Female	Count	17	17	34
		% within Sex	50.0%	50.0%	100.0%
		% within Mesh	68.0%	68.0%	68.0%
Total		Count	25	25	50
		% within Sex	50.0%	50.0%	100.0%
		% within Mesh	100.0%	100.0%	100.0%

Figure 2 shows sex distribution



Symptoms

In total 50 cases, 33 patient has only swelling and 17 patient has both swelling and pain.

SL NO.	SYMPTOMS	NO. OF PATIENTS	PERCENTAGE
1	Swelling	33	66
2	Swelling & Pain	17	34

Tables 3 shows symptoms

			Mesh		Total
			Onlay Mesh Repair	Preperitoneal Mesh Repair	
Compliants	Swelling	Count	18	15	33
		% within Compliants	54.5%	45.5%	100.0%
		% within Mesh	72.0%	60.0%	66.0%
	Swelling and Pain	Count	7	10	17
		% within Compliants	41.2%	58.8%	100.0%
		% within Mesh	28.0%	40.0%	34.0%
Total		Count	25	25	50
		% within Compliants	50.0%	50.0%	100.0%
		% within Mesh	100.0%	100.0%	100.0%

Figure 3 shows symptoms

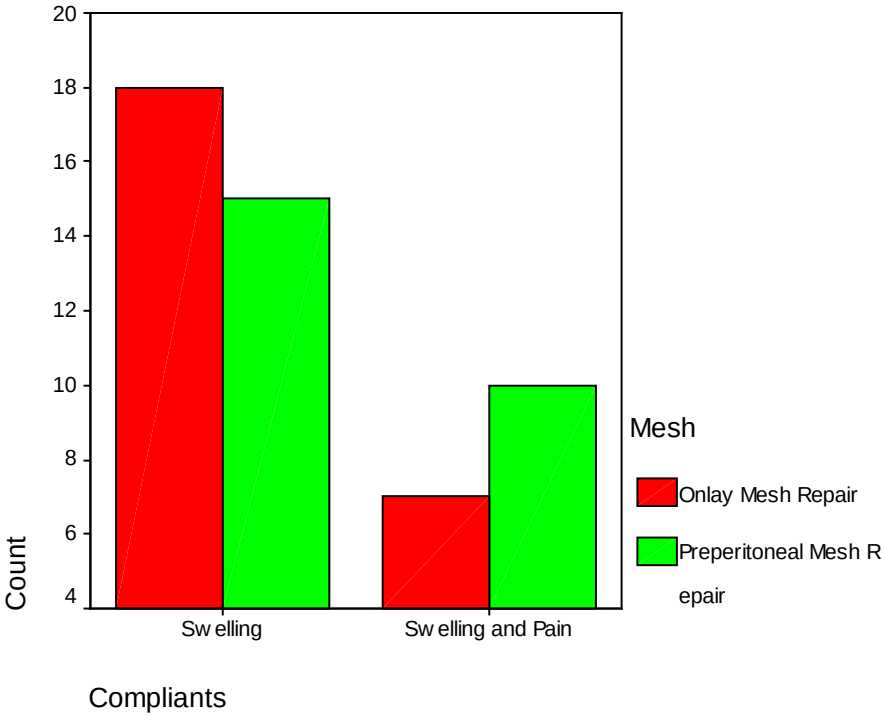


Table 4 Diabetes Mellitus * Mesh

			Mesh		Total
			Onlay Mesh Repair	Preperitoneal Mesh Repair	
Diabetes Mellitus	Yes	Count	6	7	13
		% within Diabetes Mellitus	46.2%	53.8%	100.0%
		% within Mesh	24.0%	28.0%	26.0%
	No	Count	19	18	37
		% within Diabetes Mellitus	51.4%	48.6%	100.0%
		% within Mesh	76.0%	72.0%	74.0%
Total		Count	25	25	50
		% within Diabetes	50.0%	50.0%	100.0%
		% within Mesh	100.0%	100.0%	100.0%

Figure 4 Diabetes Mellitus

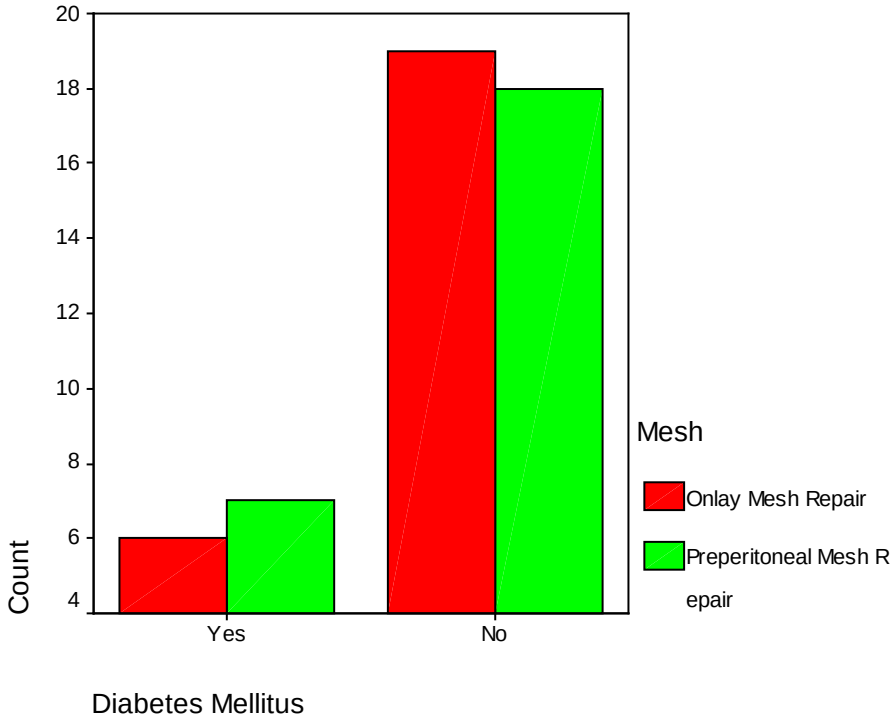


Table 5 Hypertention * Mesh

			Mesh		Total
			Onlay Mesh Repair	Preperitoneal Mesh Repair	
Hypertention	Yes	Count	9	11	20
		% within Hypertention	45.0%	55.0%	100.0%
		% within Mesh	36.0%	44.0%	40.0%
	No	Count	16	14	30
		% within Hypertention	53.3%	46.7%	100.0%
		% within Mesh	64.0%	56.0%	60.0%
Total		Count	25	25	50
		% within Hypertention	50.0%	50.0%	100.0%
		% within Mesh	100.0%	100.0%	100.0%

Figure 5 Hypertention

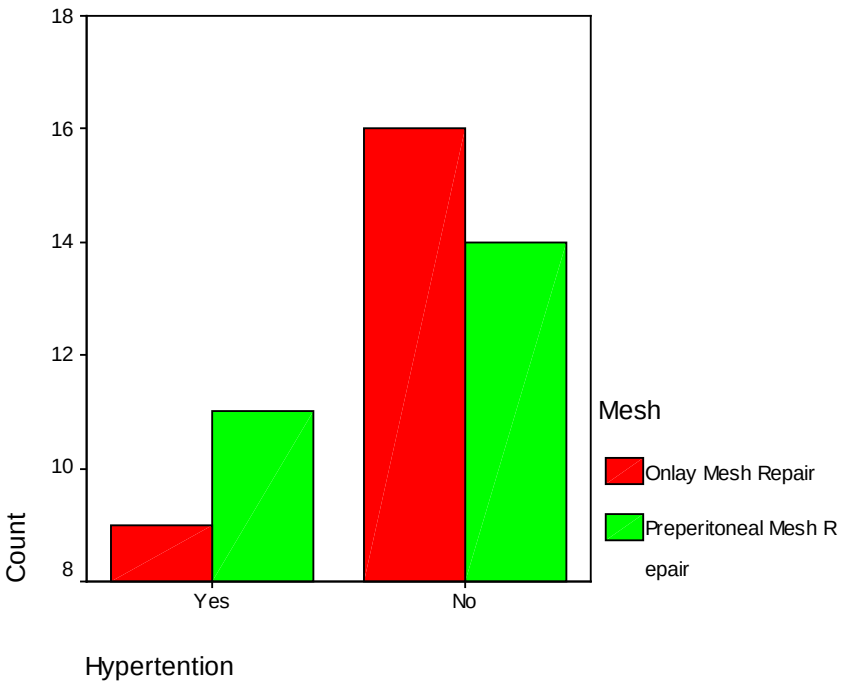


Table 6 Chronic Obsructive Pulmonary Disease * Mesh

			Mesh		Total
			Onlay Mesh Repair	Preperitoneal Mesh Repair	
COPD	Yes	Count	4	6	10
		% within COPD	40.0%	60.0%	100.0%
		% within Mesh	16.0%	24.0%	20.0%
	No	Count	21	19	40
		% within COPD	52.5%	47.5%	100.0%
		% within Mesh	84.0%	76.0%	80.0%
Total		Count	25	25	50
		% within COPD	50.0%	50.0%	100.0%
		% within Mesh	100.0%	100.0%	100.0%

Figure 6 Chronic Obsructive Pulmonary Disease

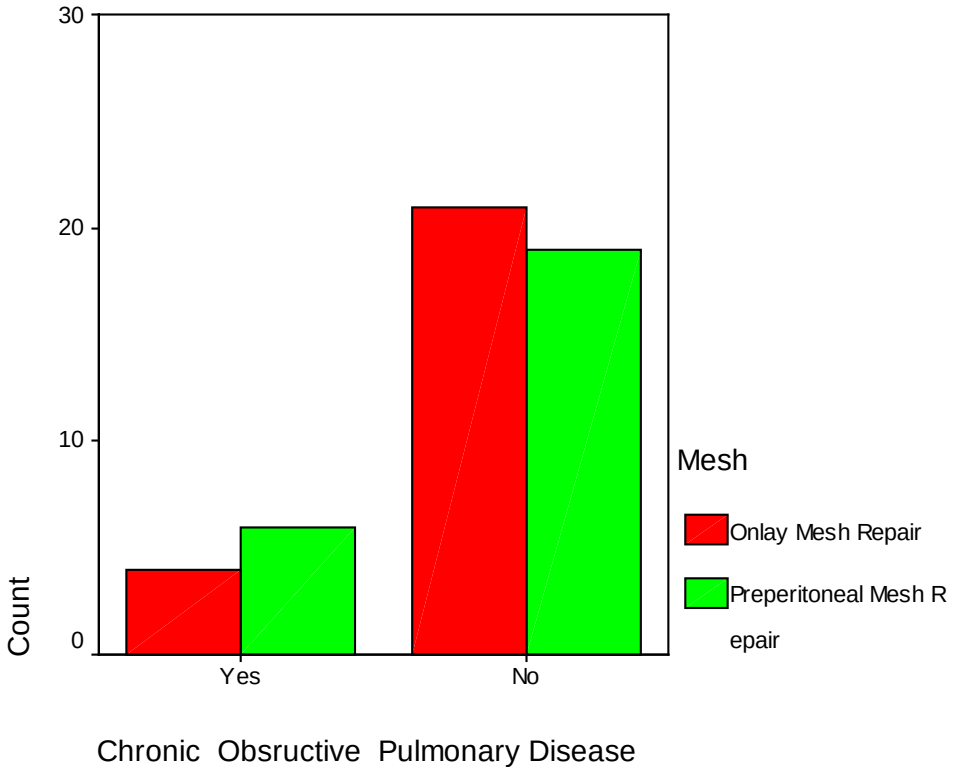


Table 7 Previous Surgery * Mesh

			Mesh		Total
			Onlay Mesh Repair	Preperitoneal Mesh Repair	
Previous Surgery	Yes	Count	13	13	26
		% within Previous Surgery	50.0%	50.0%	100.0%
		% within Mesh	52.0%	52.0%	52.0%
	No	Count	12	12	24
		% within Previous Surgery	50.0%	50.0%	100.0%
		% within Mesh	48.0%	48.0%	48.0%
Total		Count	25	25	50
		% within Previous Surgery	50.0%	50.0%	100.0%
		% within Mesh	100.0%	100.0%	100.0%

Figure 7 Previous Surgery

.

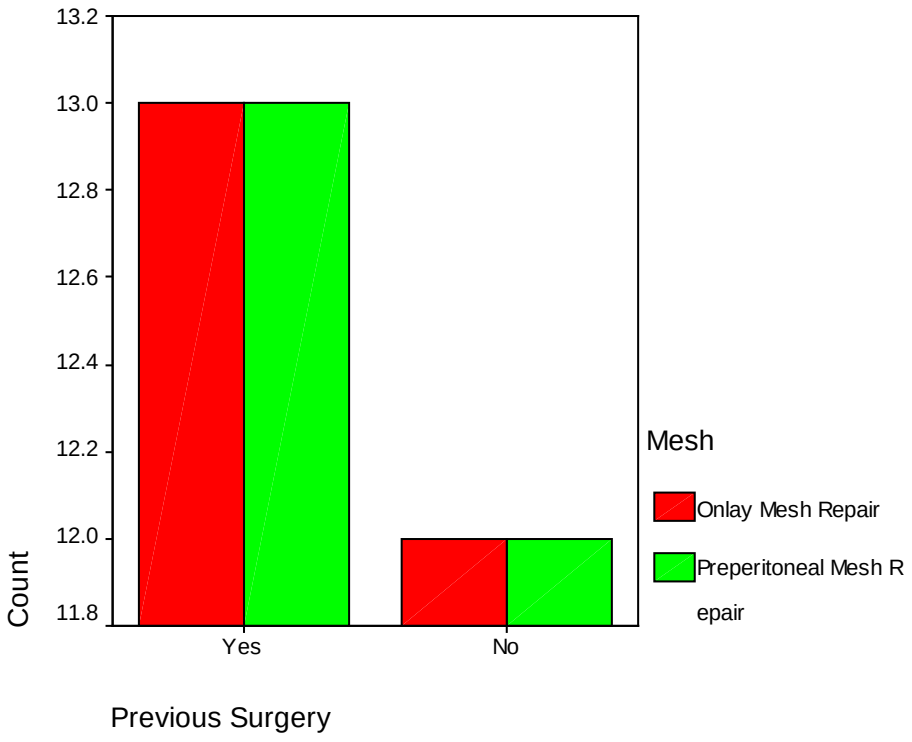


Table 8 Diagnosis * Mesh

In total 50 cases, 21 cases diagnosed as incissional hernias, 11 cases as epigastric hernia, 9cases as paraumblical hernia and 9 cases as umbilical hernia.

			Mesh		Total
			Onlay Mesh Repair	Preperitoneal Mesh Repair	
Diagnosis	IH	Count	10	11	21
		% within Diagnosis	47.6%	52.4%	100.0%
		% within Mesh	40.0%	44.0%	42.0%
	EH	Count	6	5	11
		% within Diagnosis	54.5%	45.5%	100.0%
		% within Mesh	24.0%	20.0%	22.0%
	PH	Count	5	4	9
		% within Diagnosis	55.6%	44.4%	100.0%
		% within Mesh	20.0%	16.0%	18.0%
	UH	Count	4	5	9
		% within Diagnosis	44.4%	55.6%	100.0%
		% within Mesh	16.0%	20.0%	18.0%
Total		Count	25	25	50
		% within Diagnosis	50.0%	50.0%	100.0%
		% within Mesh	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.361(a)	3	.948
Likelihood Ratio	.361	3	.948
Linear-by-Linear Association	.000	1	1.000
No. of Valid Cases	50		

A 4 cells (50.0%) have expected count less than 5. The minimum expected count is 4.50.

Figure 8 Diagnosis

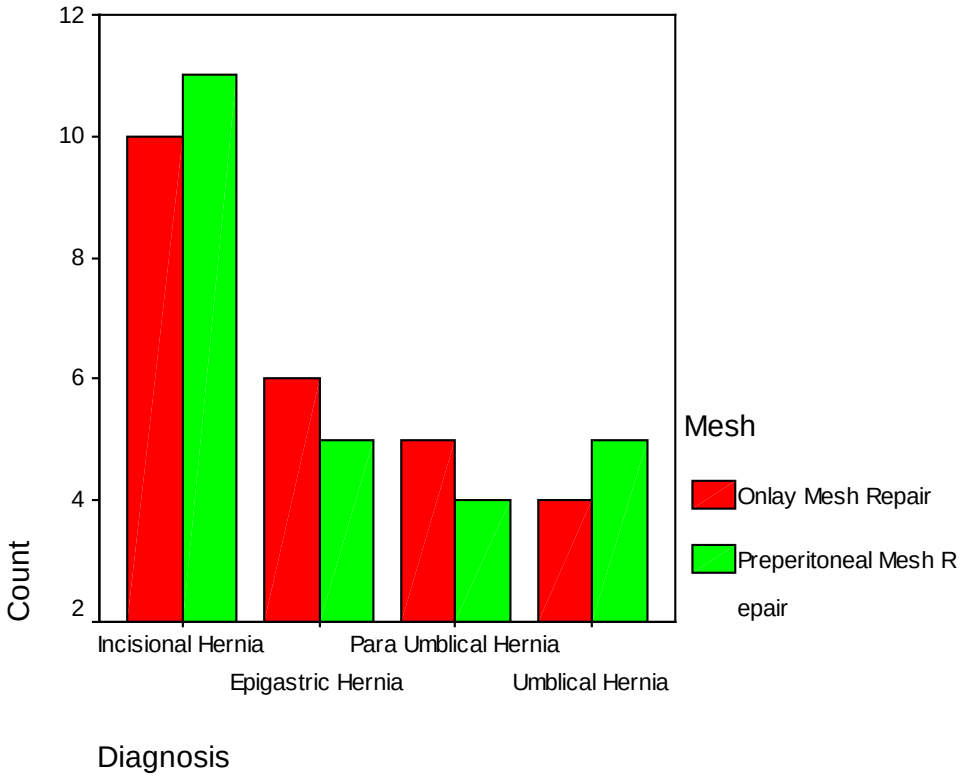
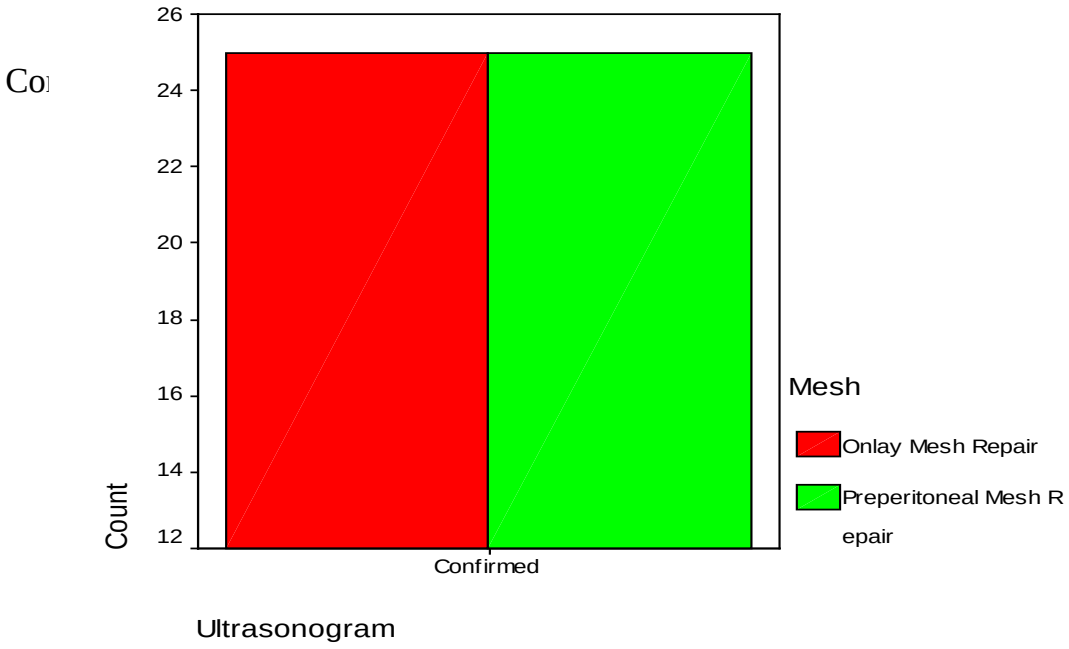


Table 9 Ultrasonogram * Mesh

			Mesh		Total
			Onlay	Preperitoneal	
USG	Confirmed	Count	25	25	50
		% within USG	50.0%	50.0%	100.0%
		% within Mesh	100.0%	100.0%	100.0%
Total		Count	25	25	50
		% within USG	50.0%	50.0%	100.0%
		% within Mesh	100.0%	100.0%	100.0%

Figure 9 Ultrasonogram



Content of the sac

Majority of the patients had omentum as the content of the sac 29 (58%), 12 (24%) had jejunum and 9(18%) had ileum.

Table 10 content of sac

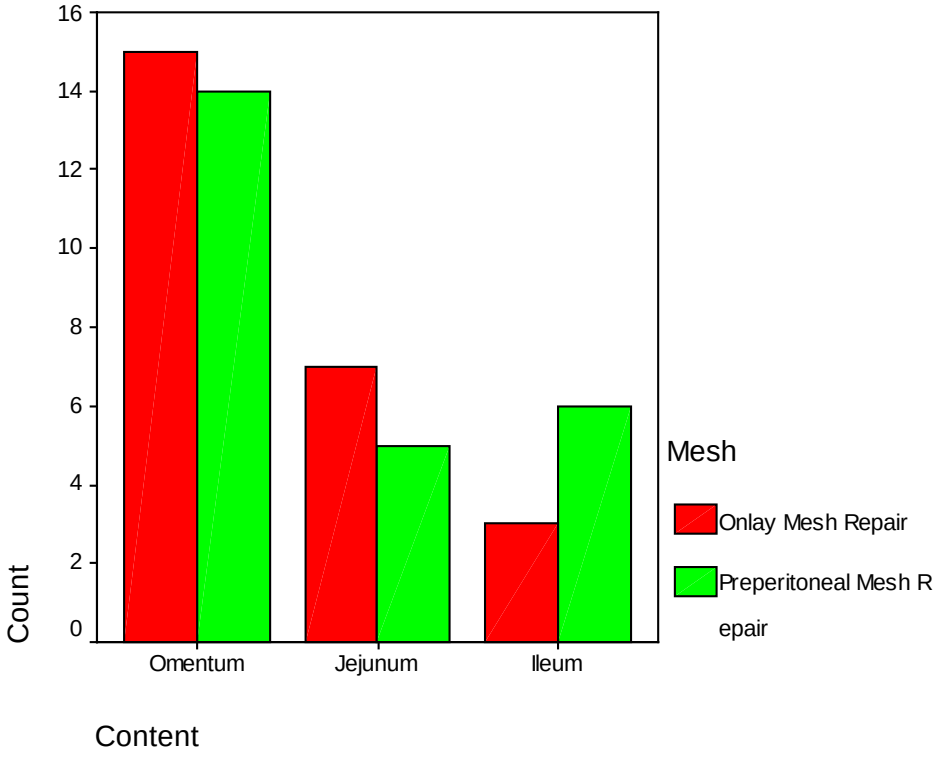
			Mesh		Total
			Onlay	Preperitoneal	
Content	Omentum	Count	15	14	29
		% within Content	51.7%	48.3%	100.0%
		% within Mesh	60.0%	56.0%	58.0%
	Jejunum	Count	7	5	12
		% within Content	58.3%	41.7%	100.0%
		% within Mesh	28.0%	20.0%	24.0%
	Ileum	Count	3	6	9
		% within Content	33.3%	66.7%	100.0%
		% within Mesh	12.0%	24.0%	18.0%
Total		Count	25	25	50
		% within Content	50.0%	50.0%	100.0%
		% within Mesh	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.368(a)	2	.505
Likelihood Ratio	1.389	2	.499
Linear-by-Linear Association	.523	1	.470
N of Valid Cases	50		

A 2 cells (33.3%) have expected count less than 5. The minimum expected count is 4.50.

Figure 10 content of sac



In 50 cases, 12 patient got seroma on which 9 patient underwent onlay mesh repair and 3 patient underwent preperitoneal mesh repair.

Table 11 seroma

			Mesh		Total
			Onlay Mesh Repair	Preperitoneal Mesh Repair	
Seroma	Yes	Count	9	3	12
		% within Seroma	75.0%	25.0%	100.0%
		% within Mesh	36.0%	12.0%	24.0%
	No	Count	16	22	38
		% within Seroma	42.1%	57.9%	100.0%
		% within Mesh	64.0%	88.0%	76.0%
Total		Count	25	25	50
		% within Seroma	50.0%	50.0%	100.0%
		% within	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	3.947(b)	1	.047		
Continuity Correction(a)	2.741	1	.098		
Likelihood Ratio	4.091	1	.043		
Fisher's Exact Test				.095	.048
Linear-by-Linear Association	3.868	1	.049		
N of Valid Cases	50				

a Computed only for a 2x2 table

b 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.00.

Figure 11 seroma

Wound Infection * Mesh

In 50 cases, 10 cases got wound infection of this 8 cases are onlay mesh repair and 2 cases are preperitoneal mesh repair.

Table 12 wound infection

			Mesh		Total
			Onlay	Pre peritoneal	
Wound Infection	Yes	Count	8	2	10
		% within WI	80.0%	20.0%	100.0%
		% within Mesh	32.0%	8.0%	20.0%
	No	Count	17	23	40
		% within WI	42.5%	57.5%	100.0%
		% within Mesh	68.0%	92.0%	80.0%
Total		Count	25	25	50
		% within WI	50.0%	50.0%	100.0%
		% within Mesh	100.0%	100.0%	100.0%

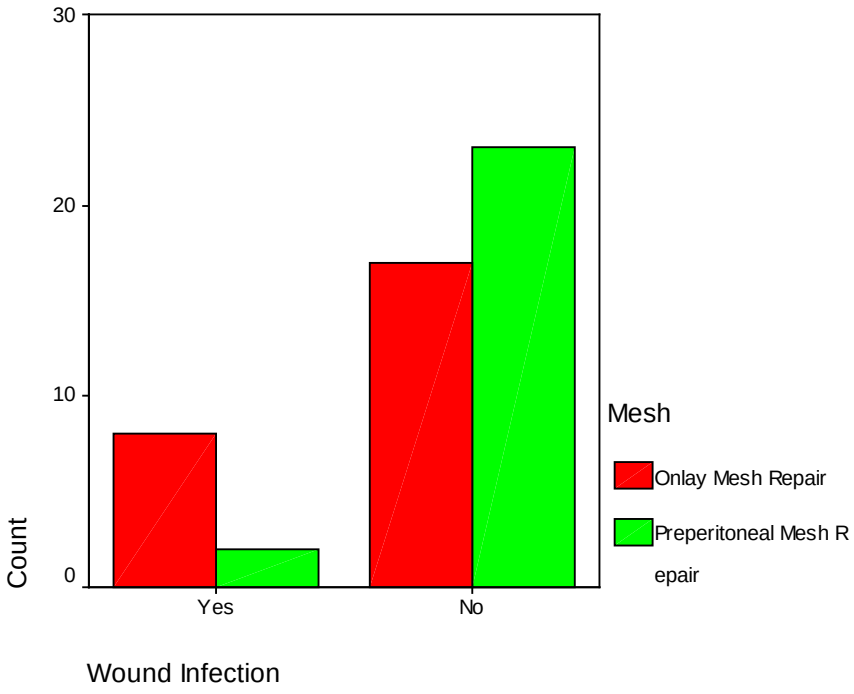
Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	4.500(b)	1	.034		
Continuity Correction(a)	3.125	1	.077		
Likelihood Ratio	4.758	1	.029		
Fisher's Exact Test				.074	.037
Linear-by-Linear Association	4.410	1	.036		
N of Valid Cases	50				

a Computed only for a 2x2 table

b 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.00.

Figure 12 wound infection



Out of 50 cases,0 patient got flap necrosis in preperitoneal mesh repair and 4 patient got flap necrosis in onlay mesh repair.

Table 13 flap necrosis

			Mesh		Total
			Onlay Mesh Repair	Preperitoneal Mesh Repair	
Flap NEC	Yes	Count	4	0	4
		% within Flap NEC	100.0%	.0%	100.0%
		% within Mesh	16.0%	.0%	8.0%
	No	Count	21	25	46
		% within Flap NEC	45.7%	54.3%	100.0%
		% within Mesh	84.0%	100.0%	92.0%
Total		Count	25	25	50
		% within Flap NEC	50.0%	50.0%	100.0%

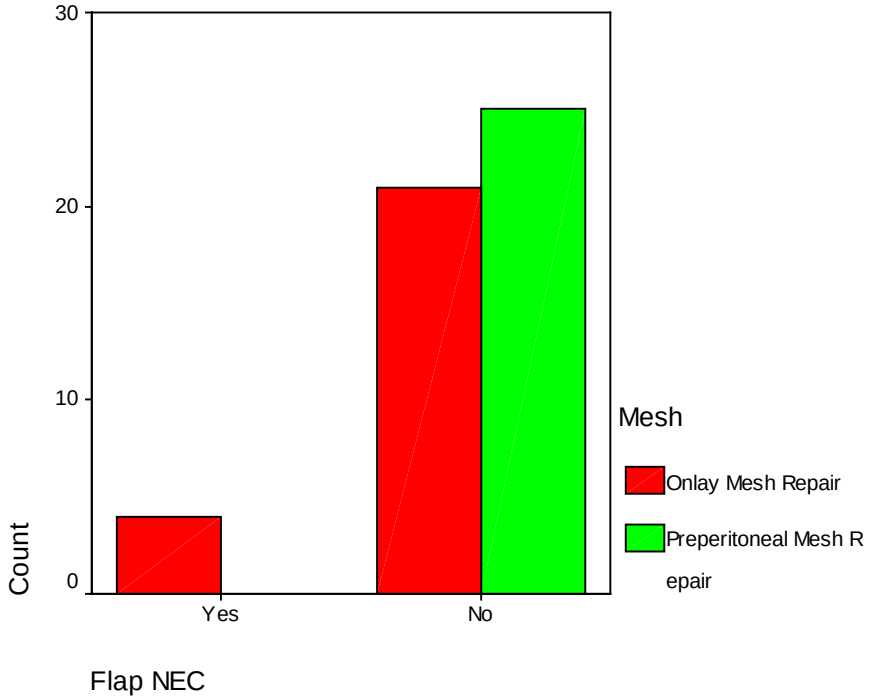
Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	4.348(b)	1	.037		
Continuity Correction(a)	2.446	1	.118		
Likelihood Ratio	5.893	1	.015		
Fisher's Exact Test				.110	.055
Linear-by-Linear Association	4.261	1	.039		
N of Valid Cases	50				

a Computed only for a 2x2 table

b 2 cells (50.0%) have expected count less than 5. The minimum expected count is 2.00.

Figure 13 flap necrosis



Out of 50 patient, 0 recurrence is seen preperitoneal mesh repair and 4 patient has recurrence in onlay mesh repair

Table 14 recurrence

			Mesh		Total
			Onlay Mesh Repair	Preperitoneal Mesh Repair	
Reccurence	Yes	Count	4	0	4
		% within Reccurence	100.0%	.0%	100.0%
		% within Mesh	16.0%	.0%	8.0%
	No	Count	21	25	46
		% within Reccurence	45.7%	54.3%	100.0%
		% within Mesh	84.0%	100.0%	92.0%
Total		Count	25	25	50
		% within Reccurence	50.0%	50.0%	100.0%
		% within Mesh	100.0%	100.0%	100.0%

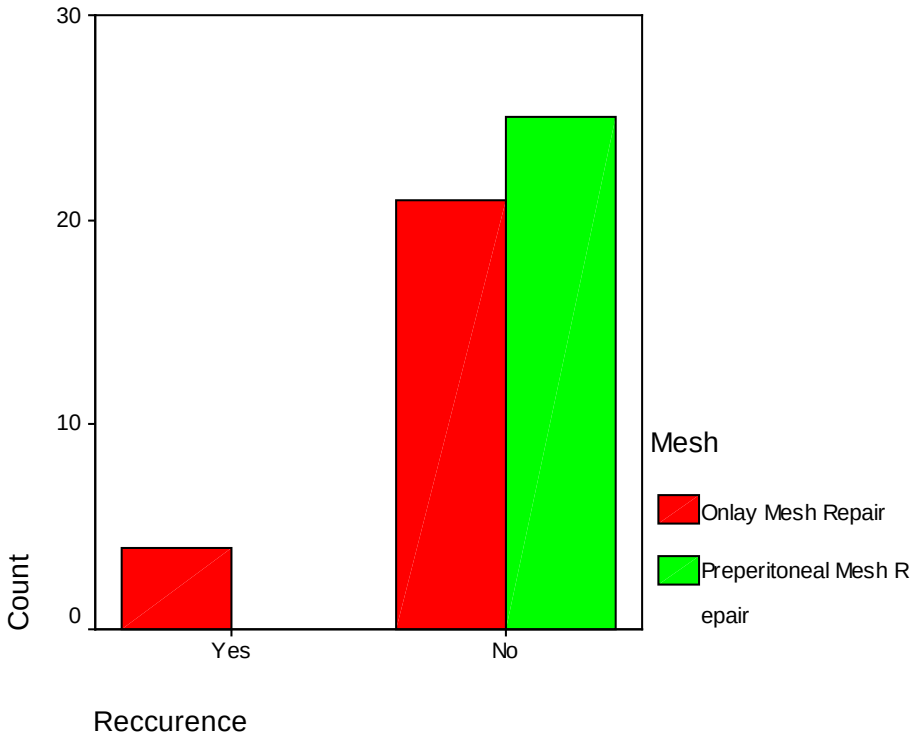
Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	4.348(b)	1	.037		
Continuity Correction(a)	2.446	1	.118		
Likelihood Ratio	5.893	1	.015		
Fisher's Exact Test				.110	.055
Linear-by-Linear Association	4.261	1	.039		
N of Valid Cases	50				

a Computed only for a 2x2 table

b 2 cells (50.0%) have expected count less than 5. The minimum expected count is 2.00

Figure 14 recurrence



T-Test

Group Statistics

	Mesh	N	Mean	Std. Deviation	Std. Error Mean
Duration of Stay in Hospital	Onlay	25	9.16	2.609	.522
	Preperitoneal	25	7.80	1.080	.216

Independent Samples Test

	t-test for Equality of Means						
	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
Duration of Stay in Hospital	2.408	48	.020	1.36	.565	.225	2.495
	2.408	31.992	.022	1.36	.565	.210	2.510

Table 15: The percentage distribution of ventral hernias in our study is shown in Table 1 and Graph 1.

TABLE 15: The ventral hernias with respect to number and percentage

Sl No.	Type of Hernia	Number	Percentage
1	Incisional hernia	21	42
2	Paraumbilical hernia	09	18
3	Umblical hernia	09	18
4	Epigastric hernia	11	22
	Total	**50**	**100%**

Antibiotic

All patients were given a dose of third generation cephalosporin before the anaesthesia, continued with intravenous antibiotics post operatively.

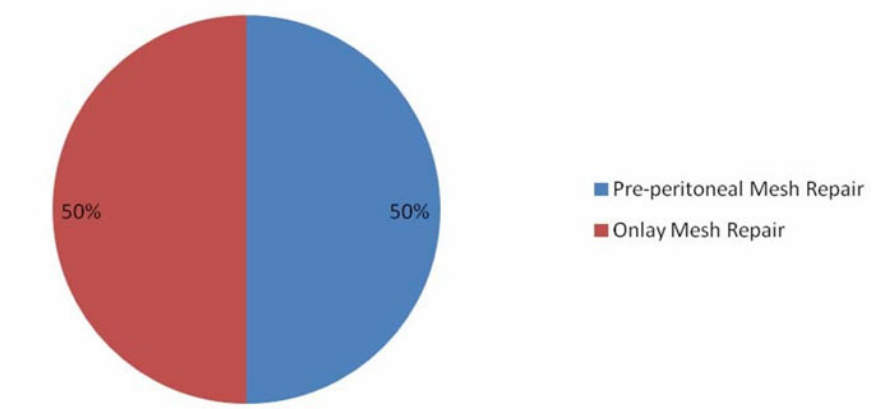
Type of mesh repair

25 (50%) Patients underwent Pre-peritoneal mesh repair and 25(50%) patients underwent onlay mesh repair.

Table 16: Types of mesh repair

Sl. No	Type of Mesh repair	No. of Patients	Percentage (%)
1	Pre-peritoneal Mesh Repair	25	50
2	Onlay Mesh Repair	25	50
3	Total	50	100

Figure 15 Type of Mesh Repair



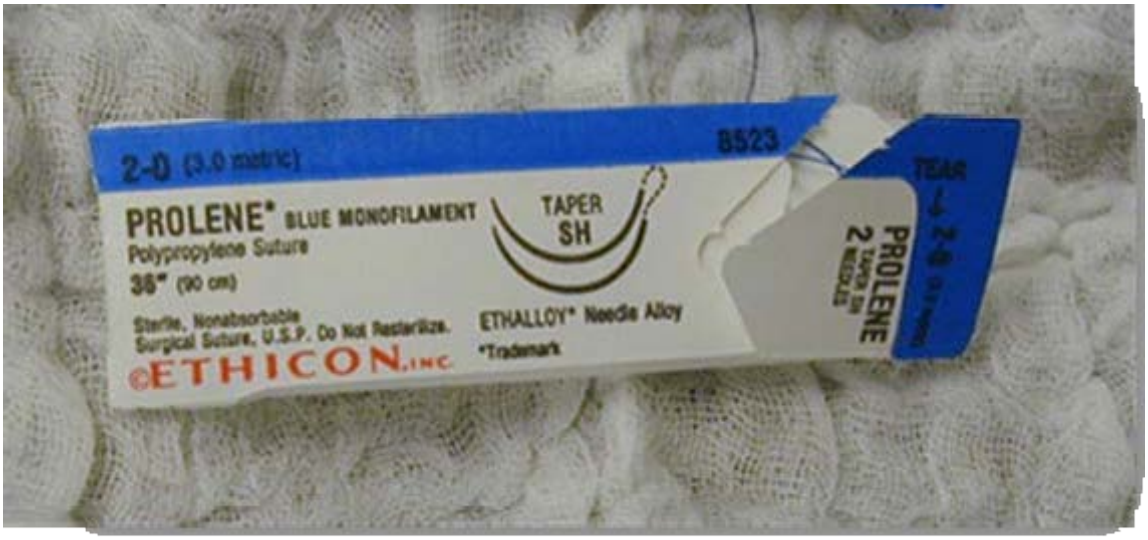
Follow up and recurrence

TABLE 17: Recurrence

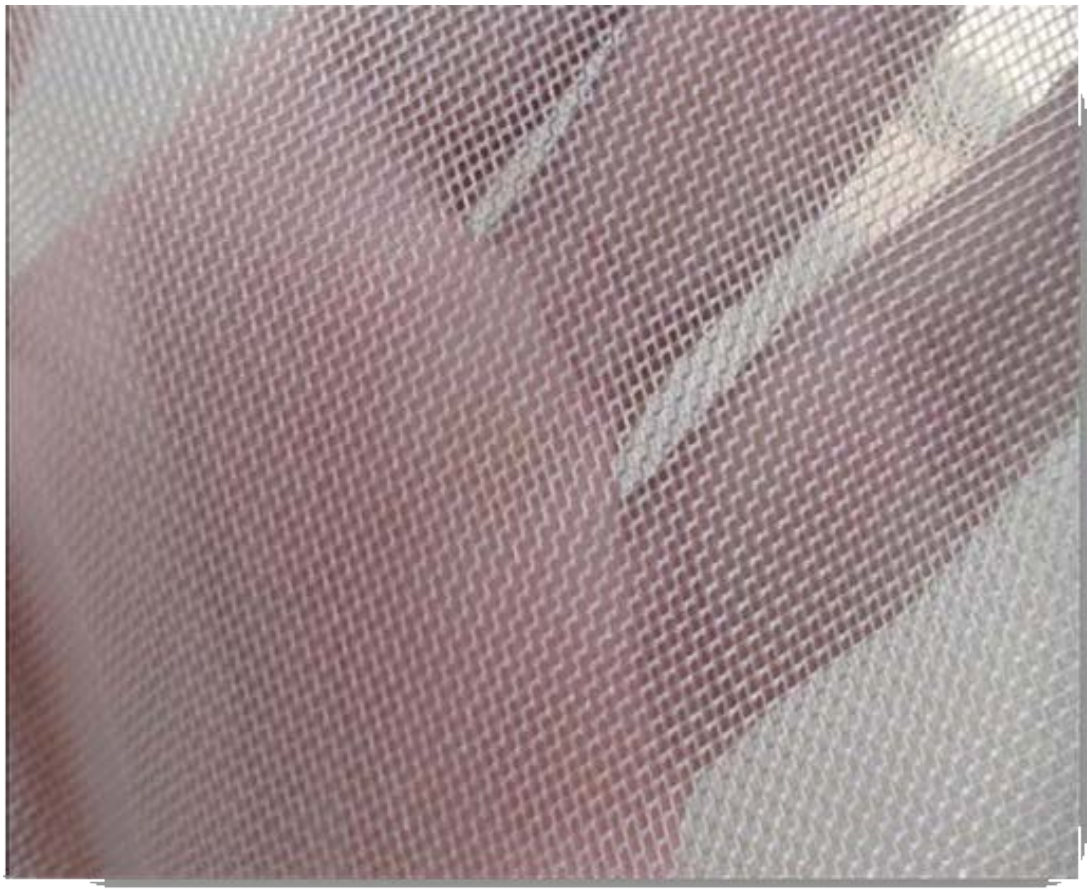
Sl No.	Type of operation	Recurrence	Percentage (%)	P value
1	Pre-peritoneal mesh repair	0	0	
2	Onlay Mesh repair	4	13.33	**< 0.04**

Recurrence was observed only in patients with onlay mesh repair.

PHOTOGRAPHS



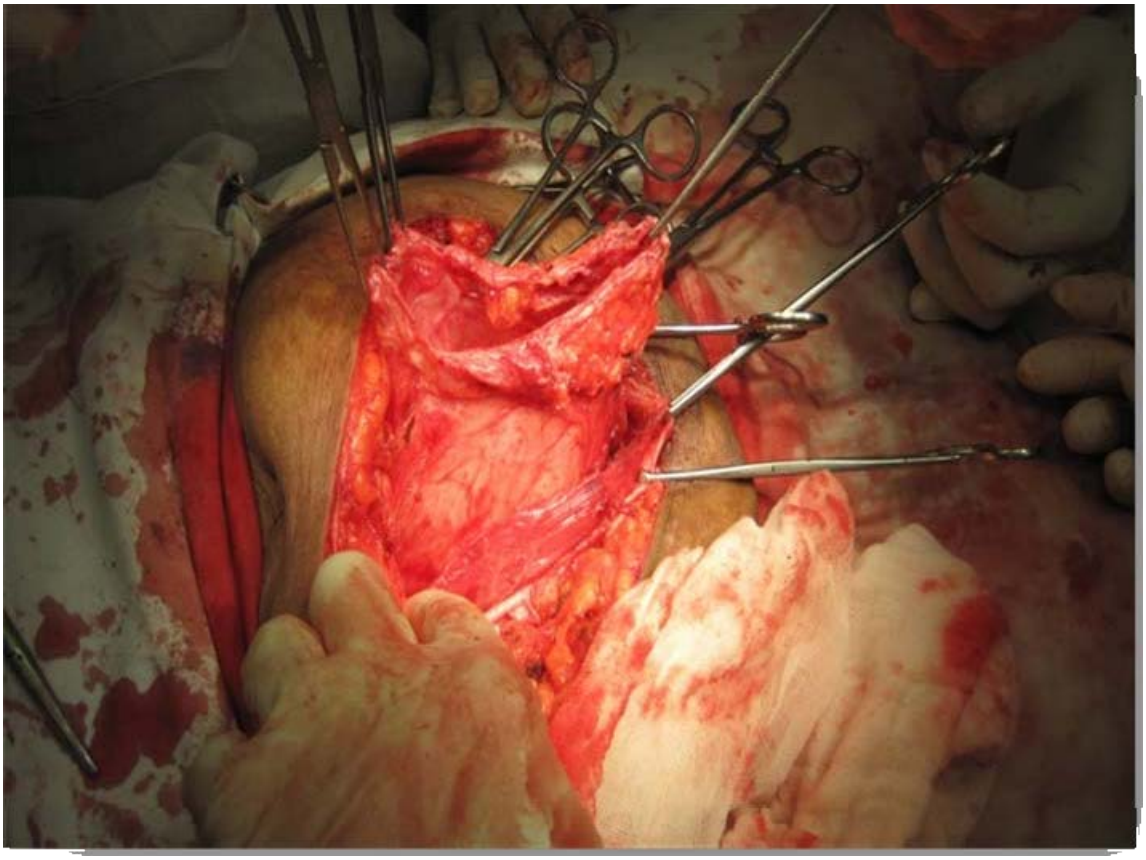
PROLENE 2.0 SUTURE MATERIAL



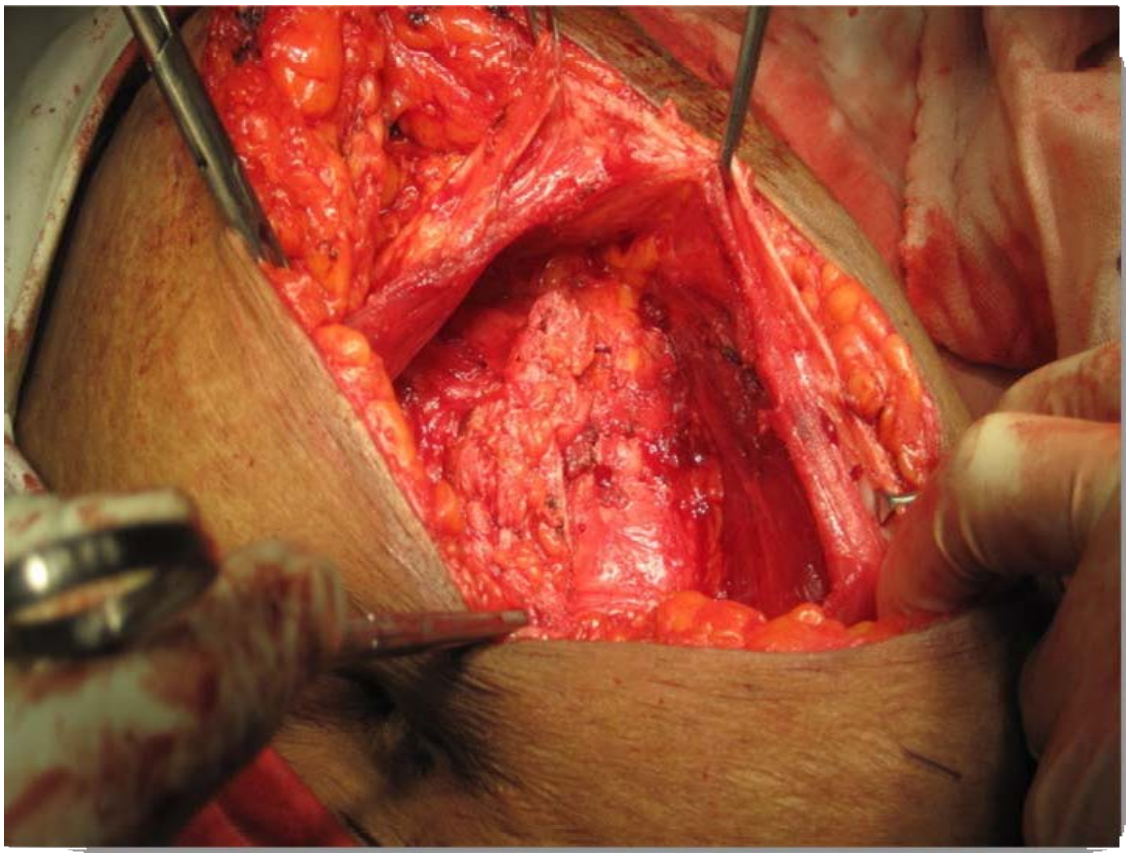
POLYPROPYLENE MESH

INCISIONAL HERNIA

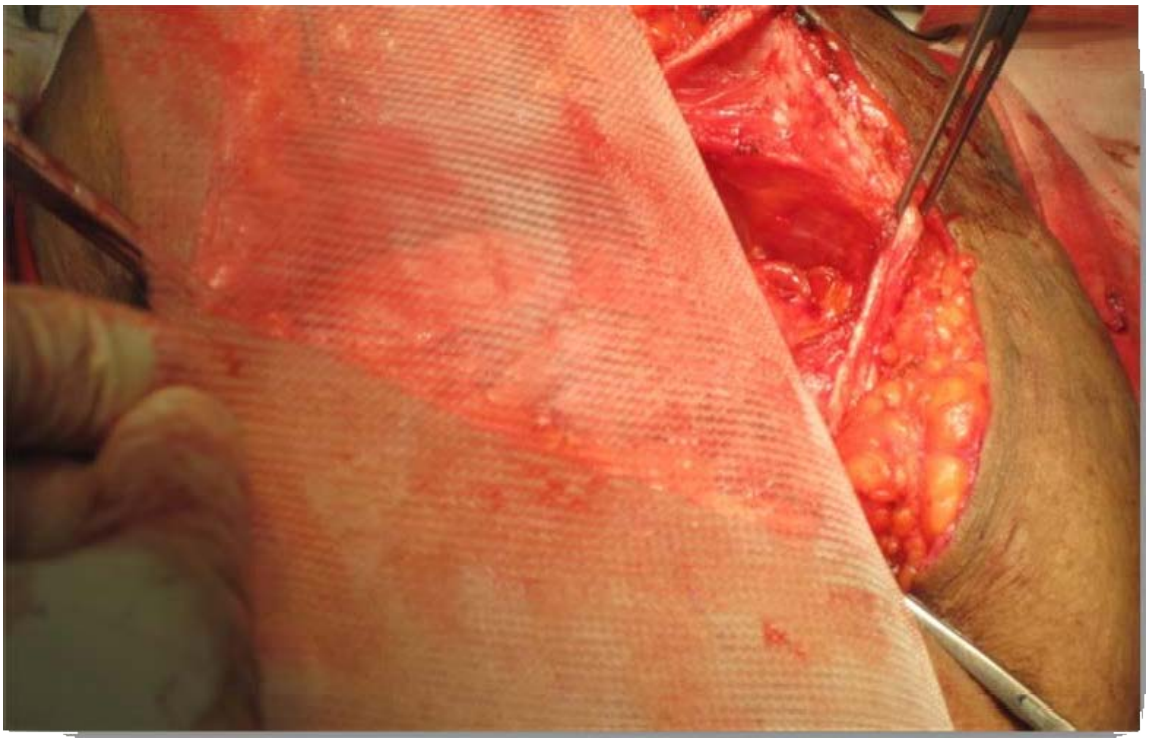
INCISIONAL HERNIA



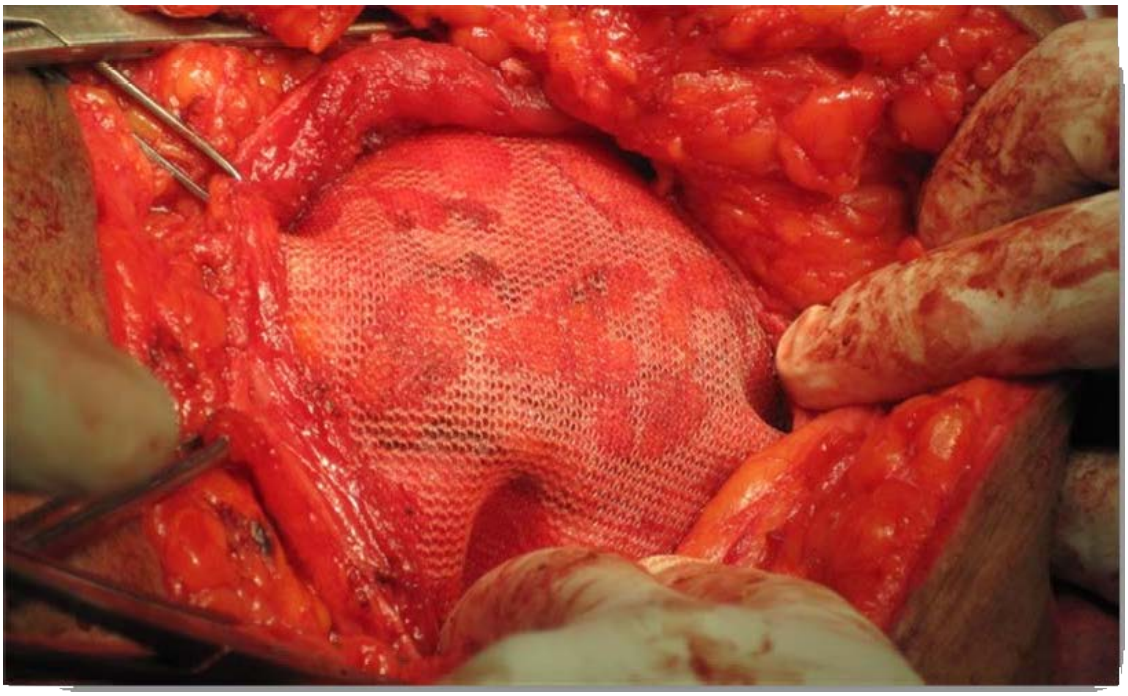
INCISSIONAL HERNIAL SAC



PERITONEUM CLOSED



MESH BEING PLACED



PRE-PERITONEAL REPAIR

DISCUSSION

DISCUSSION

Ventral hernia in the anterior abdominal wall includes both spontaneous and incisional hernias after an abdominal operation. It is estimated that 2 to 10% of all abdominal operations result in an incisional hernia.

Small hernias less than 2.5 cm in diameter are often successfully closed with primary tissue repairs. However, larger ones have a recurrence rate of up to 30-40% when a tissue repair alone is performed [3]. Hernia recurrence is distressing to patient and embarrassing to surgeons. Nowadays tension free repair using prosthetic mesh has decreased recurrence to negligible. Despite excellent results increased risk of infection with placement of a foreign body and cost factor still exist; however, operating time and hospital length of stay are shortened. Primary tissue repair is associated with higher unacceptable recurrence rate, nowadays; tension free mesh repair is ideal hernia repair technique [4].

Mesh repair can be pre-peritoneal or onlay. Controversy exists among the surgeons regarding the use of type of either mesh repair, due to differences in ease in performing the surgery, time of surgery, complications occurring in the post operative period and the recurrence.

In our study attempt has been made to study both types of these mesh repair and their outcome. 2010

In the study, 50 patients with Ventral Hernia, attending and admitted to **Royapettah hospital and kilpauk medical college Hospital** from Nov 2014 to April 2015 were treated with pre-peritoneal and onlay mesh repair were studied.

INCIDENCE

Incidence among ventral hernias was Incisional hernia-42%, Paraumbilical hernia-18%, umbilical hernia 18%.epigastric hernia 22%

AGE

Ventral hernias are more common in patients aged between 30-40 years (48%) in our study. Youngest patient in our study was 28 years old. It was found that ventral hernias are rare after >50 years.

SEX

Ventral hernias are more common among females.34 patients were females and 16 patients were male. In literature the ratio is 3:1. in our study it is 2.12:1. There is no significance difference in age distribution in males and females, as disease is more common between 30 to 40 years in both. Ellis H. et al.[2] have obtained a 64.6% of female population shown in the study of 342 patients In our study female population was 68% , while Godara et al[31] series had a female population of 42.5%.

TABLE 18

Study Group	Percentage females (%)
Ellis H. et al[2]	64.6
Godara et al[31]	42.5
Present study	68

ASSOCIATED FACTORS WITH VENTRAL HERNIAS

In females most precipitating factor was Multiparity. Out of 34 patients 17(50%) were multipara. This can be attributed to stretching and weakening of anterior abdominal wall musculo-aponeurotic layer.

13 (26%) patients were Diabetic,20(40%) patient were hypertensive and 10(20%)of patient were chronic obstructive pulmonary disease .In the present series postoperative morbidity was considerably high in hypertensive. Study shows that seroma seen in onlay and preperitoneal mesh repair is 36% and 12% respectively. Post operative wound infection seen in onlay and preperitoneal mesh repair is 32% and 8% respectively. 8% and 0% cases shows flap necrosis in onlay and preperitoneal mesh repair. Onlay and preperitoneal mesh repair shows 16% and 0% recurrence rate. Duration of stay in hospital has mean value of 9.16 in onlay mesh repair and 7.80 in preperitoneal mesh repair

CLINICAL PRESENTATION

All patients presented with swelling. About 1 7 patients had pain in the swelling or dragging type of pain abdomen and 33 patient presented with only swelling. Toms P. A. et al. concluded that abdominal hernias can present asymptomatically to life treating emergencies. About 21 cases are incisional hernia,11 cases are epigastric hernia, 9 cases are para umbilical hernia and 9 cases are umbilical hernia.

CONTENTS OF THE SAC

The commonest content of the sac observed was Omentum 29(58%), followed by Jejunum 12(24%), ileum 9(18%).

COMPLICATIONS

The most common complication observed was seroma in 12 patients (24%). Out of 12 patients 3(12%) were in pre-peritoneal and 9(36%) in onlay mesh repair group. This complication was managed with seroma drainage. Onlay technique had more of seroma formation , due to the fact that onlay techniques requires significant subcutaneous dissection to place the mesh, which can lead to devitalized tissue with seroma formation or infection. The superficial location of the mesh also puts it in danger of becoming infected if there is a superficial wound infection.

Wound infection was found in 10 cases (20%). Out of these 2 (8%) were in pre- peritoneal group and 8 (32%) were in onlay group .These patients were treated with appropriate antibiotics and regular dressing. No patient required removal of mesh because the infection was superficial and responded well to antibiotics.

Flap necrosis seen in 4 patient and all 4 patient from onlay mesh repair only, because flap is raised in onlay mesh repair, so chance of vascular compromise high.

HOSPITAL STAY

The duration and duration of postoperative hospital stay shows an indirect indicator and the degree of morbidity in terms of postoperative complications.

Average post operative hospital stay period in present series for onlay Mesh repair was 9.16days, as compared to 7.80 days average hospital stay for Pre-peritoneal Mesh repair , which were comparable to series published by de Vries Relingh et al[32]and John. J. Gleysteen et al[33] .

TABLE 19 Mean hospital stay

Mean hospital stay in days	de Vries Relingh et al[32]	John. J. Gleysteen et al[33]	Present series
Onlay	8.2	7.9	9.16
Pre-peritoneal	6.1	5.9	7.80

RECURRENCE

No recurrence of hernia was noticed in Pre-peritoneal Mesh repair, in present series where as in the onlay group recurrence occurred in 4(16%) cases ($p<0.037$). John. J. Gleysteen et al[33] found a recurrence rate to be 20% in Onlay and 4% in Pre-peritonal Mesh repairs (Table 17). A retrospective study in Europe done by de Vries Relingh et al[32] (2004) noticed a recurrence rate of 23% in cases that underwent onlay mesh repair, and no recurrence in patients with Pre-peritonal mesh repair.

According to the Shackelford primary repair is often under tension in onlay meshoplasty, which can contribute to recurrence. Ideally, the transfascial sutures are placed before primary closure of the fascial defect to avoid the potential bowel injury that can occur if the sutures are placed blindly. Long-

term studies are not available to accurately describe the recurrence rate with this technique, but retrospective review suggests a rate of 28%. [39]

Pre-peritoneal mesh repair is considered superior because the mesh with significant overlap placed under the muscular abdominal wall works according to Pascal's principles of hydrostatics. The intra-abdominal cavity functions as a cylinder, and therefore the pressure is distributed uniformly to all aspects of the system. Consequently, the same forces that are attempting to push the mesh through hernia defects are also holding the mesh in place against the intact abdominal wall . In this manner, the prosthetic is held firmly in place by intra-abdominal pressure. The mechanical strength of the prosthetic prevents protrusion of the peritoneal cavity through the hernia because the hernia sac is indistensible against the mesh. Over time, the prosthetic is incorporated into the fascia and unites the abdominal wall, now without an area of weakness.

TABLE 20 Recurrence Rate

Recurrence Rate	John. J. Gleysteen et al[33]	de Vries Relingh et al[32]	Present study
Onlay	20%	23%	16%
Pre-peritoneal	4%	0	0

CONCLUSION

CONCLUSION

- In the patients presenting with ventral hernia it is important to recognise the associated risk factors like diabetes ,obesity, parity , previous surgeries in order to carefully plan the type of repair either pre-peritoneal or onlay repair to prevent the complications like wound infection, seroma formation , flap necrosis and the recurrence.
- Seroma formation, infection are found to be more commonly associated with onlay mesh repair compared to pre-peritoneal mesh repair.
- Recurrence is higher in cases of ventral hernia operated by onlay mesh repair .
- Recurrence is higher in cases with co morbidities like obesity, diabetes and multiparity.
- Although time taken for surgery in onlay mesh repair is significantly less compared to pre-peritoneal mesh repair, complications associated with it limits its wider usage. Considering the burden of surgeries especially in third world countries with limited number of surgeons, it could provide valuable alternative over pre-peritoneal repair.
- Ease of the procedure in performing onlay mesh repair over pre-peritoneal repair gives it the points over pre-peritoneal but, associated complications limits its use.
- Finally to conclude "**Pre-peritoneal mesh repair is superior to onlay mesh repair**"

SUMMARY

SUMMARY

Ventral hernia in the anterior abdominal wall includes both spontaneous and, most commonly, incisional hernias after an abdominal operation. . Hernia recurrence is distressing to patient and embarrassing to surgeons. Mesh repair can be pre-peritoneal or onlay. Controversy exists among the surgeons regarding the use of type of either mesh repair, due to differences in ease in performing the surgery, time of surgery, complications occurring in the post operative period and the recurrence.

In our study 50 patients with Ventral Hernia, attending and admitted to **Royapettah hospital and kipauk medical colleg Hospital** from Nov 2014 to April 2015 treated with pre- peritoneal and onlay mesh repair were analysed.

50 patients presenting with ventral hernia admitted were preoperatively assessed clinically and by ultrasonography to confirm the diagnosis.30 patients each underwent pre-peritoneal and onlay mesh repair after obtaining consent and satisfying the inclusion criteria.

Results were analysed based upon the factors like ease of operation, time taken for the surgery, associated factors, complications and the recurrence. Their significance was confirmed by way of analysis of statistical data using SPSS Version 20.0 software.

We observed seroma formation,wound infection and flap necrosis in 36 %, 32%, 16% patients respectively in onlay mesh repair group and in 12%, 8%, 0% patients respectively in pre- peritoneal mesh repair group. Recurrence was seen in

16% patients in onlay group .No recurrence was encountered in the pre-peritoneal mesh repair group. Associated factors morbidity was also found to be higher in onlay group. Based upon these we observed superior results in pre-peritoneal mesh repair in ventral hernia repair.

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ANNEXURE

PROFORMA

Name

I.P. no:

Age / sex:

Phone no:

Date of admission:

Date of discharge:

Occupation:

Chief complaints:

Diagnosis:

Past H/O:

Obesity/DM/HT/BPH/TB/BA

H/O previous surgery

Previous history of medical illness:

Personal H/O:

H/o smoking and alocohol intake:

Diet history:

Menstrual h/O

GENERAL EXAMINATION

Nutritional status:

Pulse rate:

Blood pressure:

Cardiovascular system:

Respiratory system:

Examination of abdomen:

Abdomen swelling

Site:

Size:

Shape:

Reducibility:

Cough impulse:

Skin over swelling:

Scar:

Consistency

Bowel sounds:

External genitalia:

Digital rectal examination:

LABORATORY INVESTIGATIONS

Complete blood count

Random blood sugar

Renal function test

Urine routine analysis

Ultrasonogram

Xray chest

ECG

MANAGEMENT:

Preoperative preparation:

Type of operation

Drain suction

Postoperative:

Anaesthetic complication:

Seroma:

Wound infection:

Flap necrosis

Recurrence

Duration of stay in hospital:

:

CONSENT FORM

சுய ஒப்புதல் படிவம்

ஆய்வு செய்யப்படும் தலைப்பு :

COMPARITIVE STUDY OF ONLAY AND PREPERITONEAL MESH REPAIR IN THE MANAGEMENT OF VENTRAL HERNIA

ஆராய்ச்சி நிலையம் : பொது அறுவை சிகிச்சைத் துறை
கீழ்பாக்கம் மருத்துவக் கல்லூரி
சென்னை – 600 010.

பங்கு பெறுபவரின் பெயர் : வயது :

பங்கு பெறுபவரின் எண். :

பங்கு பெறுபவரது இதனை (✓) குறிக்கவும்

மேலே குறிப்பிட்டுள்ள மருத்துவ ஆய்வின் விவரங்கள் எனக்கு விளக்கப்பட்டது என்னுடைய சந்தேகங்களை கேட்கவும், அதற்கான தகுந்த விளக்கங்களைப் பெறவும் வாய்ப்பளிக்கப்பட்டது. ☐

நான் இவ்வாய்வின் தன்னிச்சையாகத்தான் பங்கேற்கிறேன். எந்தக் காரணத்தினாலோ எந்தக் கட்டத்திலும் எந்த சட்ட சிக்கலுக்கும் உட்படாமல் நான் இவ்வாய்வில் இருந்து விலகிக் கொள்ளலாம் என்று அறிந்து கொண்டேன். ☐

இந்த ஆய்வு சம்மந்தமாகவோ, இதைச் சார்ந்த மேலும் ஆய்வு மேற்கொள்ளும்போது இந்த ஆய்வில் பங்குபெறும் மருத்துவர் என்னுடைய மருத்துவ அறிக்கைகளைப் பார்ப்பதற்கு என் அனுமதி தேவையில்லை என அறிந்து கொள்கிறேன். நான் ஆய்வில் இருந்து விலகிக் கொண்டாலும் இது பொருந்தும் என அறிகிறேன். ☐

இந்த ஆய்வின் மூலம் கிடைக்கும் தகவல்களையும், பரிசோதனை முடிவுகளையும் மற்றும் சிகிச்சை தொடர்பான முடிவுகளையும் மருத்துவர் மேற்கொள்ளும் ஆய்வில் பயன்படுத்திக் கொள்ளவும் அதைப் பிரசுரிக்கவும் என் முழு மனதுடன் சம்மதிக்கிறேன். ☐

இந்த ஆய்வில் பங்கு கொள்ள ஒப்புக்கொள்கிறேன். எனக்குக் கூறப்பட்ட அறிவுரைகளின்படி நடந்து கொள்வதுடன், இந்த ஆய்வை மேற்கொள்ளும் மருத்துவ அணிக்கு உண்மையுடன் இருப்பேன் என்றும் உறுதியளிக்கிறேன். என் உடல் நலம் பாதிக்கப்பட்டாலோ அல்லது எதிர்பாராத நோய்க்குறி தென்பட்டாலோ உடனே அதை மருத்துவ அணியிடம் தெரிவிப்பேன் என உறுதி அளிக்கிறேன். ☐

பங்கேற்பவரின் கையொப்பம் .....இடம் ..... தேதி
கட்டைவிரல் ரேகை

பங்கேற்பவரின் பெயர் மற்றும் விலாசம் .....

ஆய்வாளரின் கையொப்பம் ..... இடம் ..... தேதி

ஆய்வாளரின் பெயர் .....

MASTER CHART

IPNO	AGE	AGE_G	SEX	COMP	DM	HT	COPD	PRE_SUR	DIAG	USG	SIZE_DEF	CONTENT	MESH	SEROMA	WOU_INF	FLAP_NEC	RECUR	DUR_STAY
34,611	42	41-50	F	S	No	No	No	No	PH	C	3x2	OM	OL	Yes	No	No	No	10
35,962	35	31-40	F	S+P	No	No	Yes	Yes	IH	C	5X2	OM	OL	No	No	No	No	7
18,041	52	Above 50	M	S	Yes	Yes	No	No	UH	C	1x1	OM	OL	No	Yes	Yes	Yes	15
18,620	46	41-50	F	S	No	Yes	No	Yes	EH	C	3X1	OM	OL	No	No	No	No	8
34,822	29	Below 30	F	S+P	No	No	No	No	EH	C	2X2	JJ	OL	Yes	Yes	No	No	10
19,046	33	31-40	F	S+P	No	No	No	Yes	PH	C	3×2	OM	OL	Yes	Yes	Yes	No	8
35,745	44	41-50	M	S	No	Yes	No	No	UH	C	2×1	OM	OL	No	No	No	No	10
36,725	40	31-40	M	S	No	No	No	No	EH	C	3×2	OM	OL	No	No	No	No	12
35,977	33	31-40	F	S	No	No	No	Yes	IH	C	6×2	Ileum	OL	Yes	Yes	No	No	10
19,344	31	31-40	F	S+P	No	No	No	Yes	IH	C	5×2	JJ	OL	No	Yes	Yes	Yes	15
19,882	39	31-40	M	S+P	No	No	No	Yes	IH	C	3×1	JJ	OL	No	No	No	No	7
36,891	28	Below 30	F	S	No	No	Yes	Yes	PH	C	1×1	OM	OL	No	No	No	No	10
39,412	36	31-40	F	S	No	No	No	No	EH	C	3x2	OM	OL	No	No	No	No	7
40,782	55	Above 50	M	S+P	Yes	Yes	No	No	EH	C	4x2	OM	OL	Yes	Yes	No	Yes	9
20,564	34	31-40	F	S	No	No	No	Yes	IH	C	5x1	JJ	OL	Yes	Yes	No	No	10
21,593	30	Below 30	F	S	No	No	Yes	Yes	IH	C	3x2	Ileum	OL	No	No	No	No	7
41,654	41	41-50	M	S	Yes	Yes	No	No	PH	C	2x1	OM	OL	No	No	No	No	7
22,786	37	31-40	F	S	No	Yes	Yes	No	EH	C	3x2	OM	OL	No	No	No	Yes	7
43,002	30	Below 30	F	S	No	No	No	Yes	IH	C	5x2	JJ	OL	Yes	No	No	No	8
23,456	51	Above 50	M	S+P	Yes	No	No	No	UH	C	1x1	OM	OL	No	Yes	Yes	No	15
44,168	48	41-50	M	S	Yes	Yes	No	Yes	IH	C	6x2	JJ	OL	No	No	No	No	7
24,756	32	31-40	F	S	No	No	No	No	PH	C	2x2	OM	OL	No	No	No	No	7
46,812	46	41-50	F	S	No	Yes	No	No	UH	C	2x1	OM	OL	No	No	No	No	7
25,987	55	Above 50	F	S	Yes	Yes	No	Yes	IH	C	5x2	JJ	OL	Yes	No	No	No	8
26,534	36	31-40	F	S	No	No	No	Yes	IH	C	3×2	IL	OL	Yes	No	No	No	8
34,678	39	31-40	F	S	No	Yes	Yes	Yes	IH	C	4×2	JJ	PPM	No	No	No	No	7
35,908	35	31-40	F	S+P	No	No	No	No	UH	C	2X2	OM	PPM	No	No	No	No	7
19,843	53	Above 50	M	S+P	Yes	Yes	No	No	EH	C	3X2	OM	PPM	No	Yes	No	No	10
18,995	46	41-50	F	S	No	Yes	No	Yes	IH	C	5X2	IL	PPM	Yes	No	No	No	8
36,723	30	Below 30	F	S+P	No	No	No	No	PH	C	2X1	OM	PPM	No	No	No	No	7
19,308	32	31-40	F	S+P	No	No	No	No	UH	C	2X1	OM	PPM	No	Yes	No	No	8
35,276	45	41-50	M	S	Yes	Yes	Yes	No	EH	C	3X2	OM	PPM	Yes	No	No	No	8
35,001	39	31-40	M	S+P	No	No	No	No	UH	C	1x1	OM	PPM	No	No	No	No	7
19,476	34	31-40	F	S	No	No	No	Yes	IH	C	5X2	IL	PPM	No	No	No	No	7
20,456	33	31-40	F	S+P	No	No	No	Yes	IH	C	4x2	JJ	PPM	No	No	No	No	10
36,523	37	31-40	M	S+P	No	No	No	Yes	IH	C	3×1	JJ	PPM	No	No	No	No	7
37,809	30	Below 30	F	S	No	No	Yes	Yes	PH	C	1×1	OM	PPM	No	No	No	No	7
38,564	37	31-40	F	S	No	No	No	Yes	EH	C	3x2	OM	PPM	No	No	No	No	7
21,665	53	Above 50	M	S+P	Yes	Yes	No	No	EH	C	4x2	OM	PPM	No	No	No	No	10
22,489	36	31-40	F	S	No	No	No	Yes	IH	C	5x1	IL	PPM	No	No	No	No	7
39,786	29	Below 30	F	S	No	No	Yes	No	PH	C	3x2	OM	PPM	No	No	No	No	9
24,834	42	41-50	M	S+P	Yes	Yes	No	Yes	IH	C	4X1	IL	PPM	No	No	No	No	7
41,389	38	31-40	F	S	No	Yes	Yes	No	EH	C	3x2	OM	PPM	No	No	No	No	7
42,609	31	31-40	F	S	No	No	No	Yes	IH	C	5x2	JJ	PPM	No	No	No	No	8
25,879	52	Above 50	M	S+P	Yes	Yes	No	No	UH	C	1x1	OM	PPM	No	No	No	No	9
43,622	49	41-50	M	S	Yes	Yes	No	Yes	IH	C	6x2	IL	PPM	No	No	No	No	7
26,943	34	31-40	F	S	No	No	No	No	PH	C	2x2	OM	PPM	No	No	No	No	7
44,898	48	41-50	F	S	No	Yes	No	No	UH	C	2x1	OM	PPM	No	No	No	No	7
45,389	52	Above 50	F	S	Yes	Yes	No	Yes	IH	C	5x2	JJ	PPM	Yes	No	No	No	9
26,711	36	31-40	F	S	No	No	Yes	Yes	IH	C	3×2	IL	PPM	No	No	No	No	8